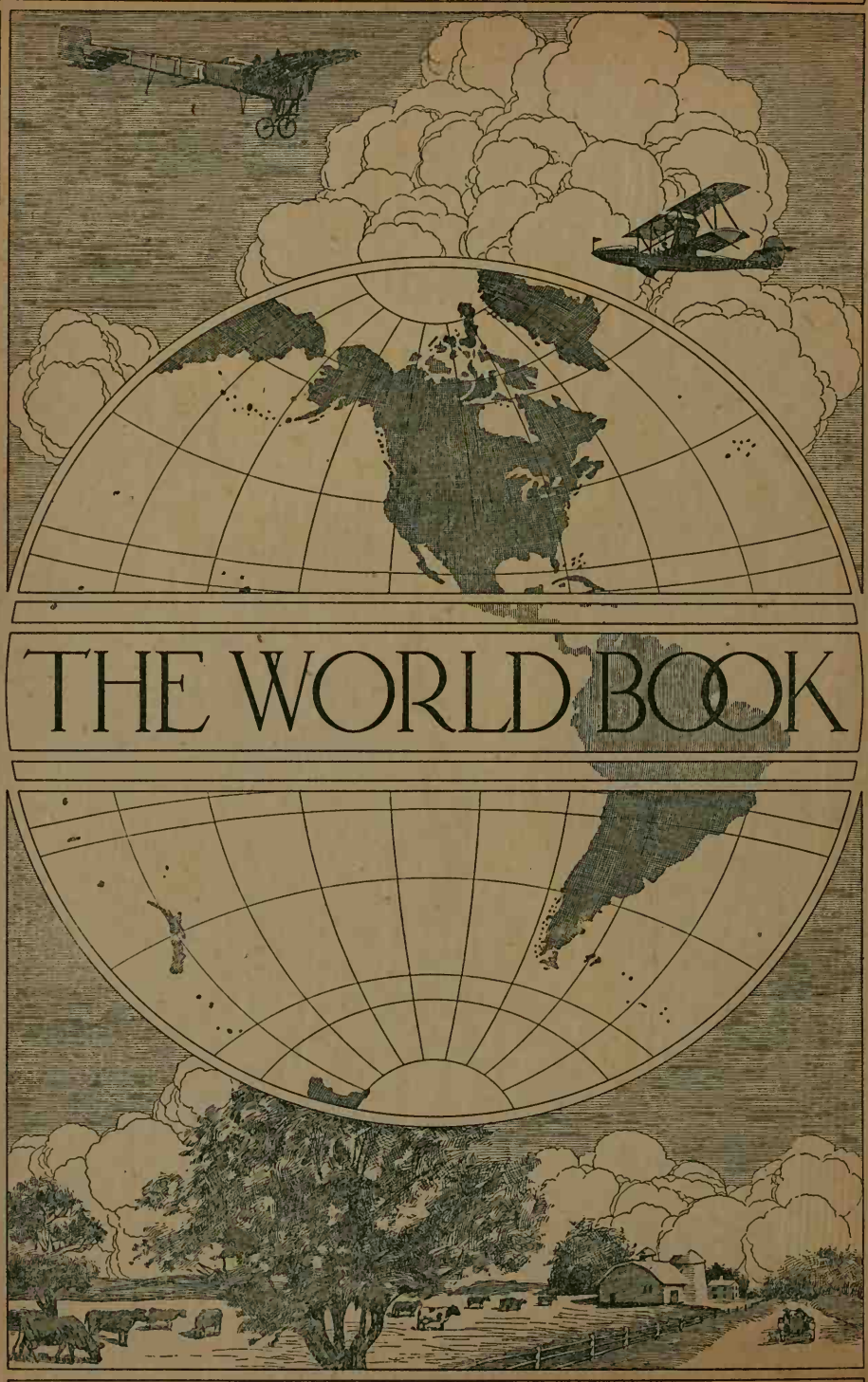
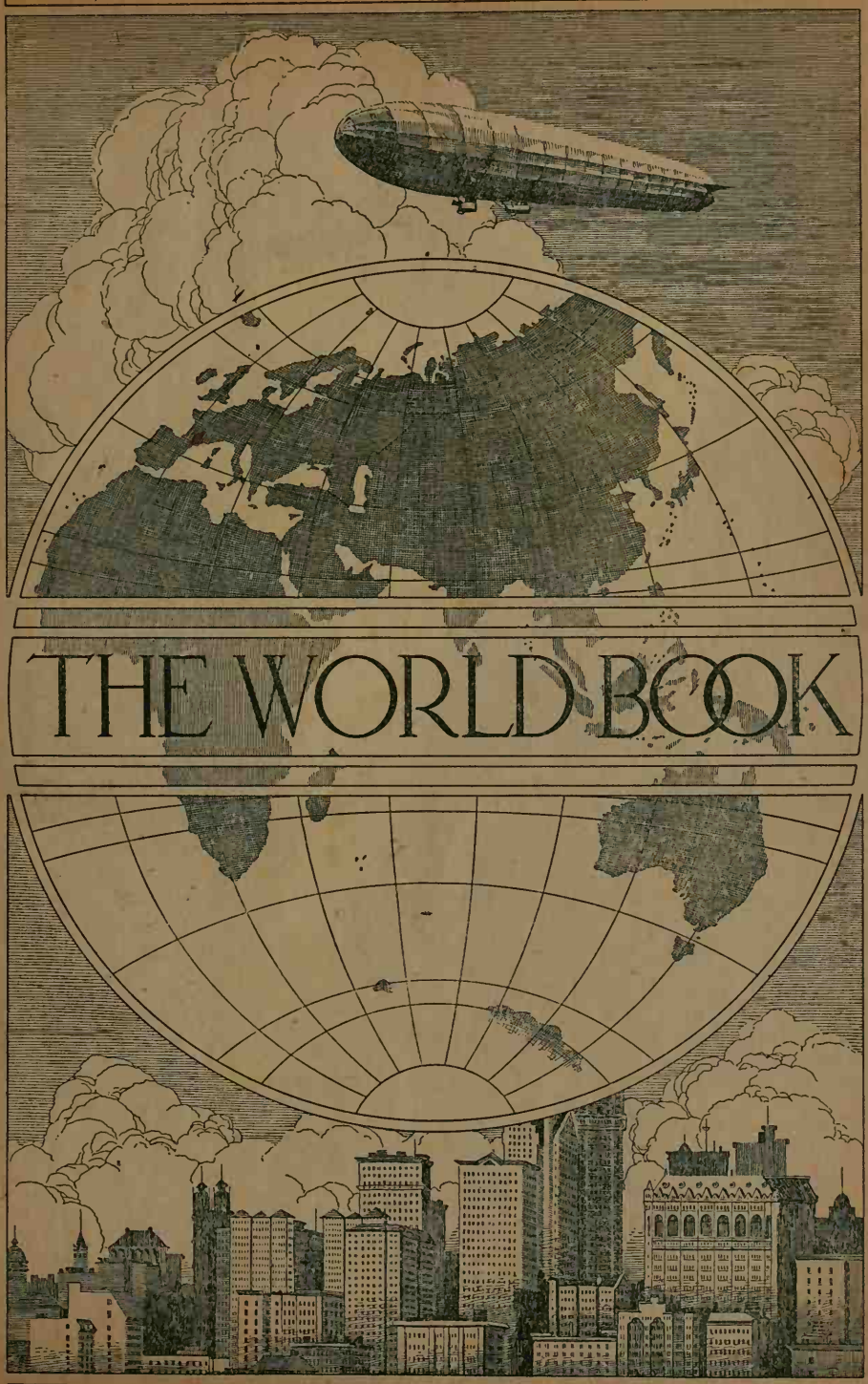


THE WORLD BOOK



THE WORLD BOOK

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ORGANIZED KNOWLEDGE IN STORY AND PICTURE

TRADE MARK REGISTERED

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ELECTROLYTE, *e lek' tro lite,* any chemical compound which can be decomposed by an electric current. The substance resulting from such decomposition is called an *ion.*

ELEC'TROMAG'NET, a magnet produced by the magnetic action of an electric current. An electromagnet consists essentially of a coil of wire having an iron core, and it is usually of horseshoe form. The story of the development of the electromagnet is the story of our modern electrical industries, for the electromagnet is the foundation of nearly all the great electrical inventions. Without it there could be no telegraph, telephone, electric light or electric power.

Strong electromagnets are used for lifting heavy weights of iron. The lifting magnet is lowered from the arm of a crane until it is in contact with the iron; the electric circuit is then closed and the magnet attracts the iron and holds it firmly. Magnet and iron are then lifted by the crane, swung to the place where it is desired to deposit the iron, when the current is cut off and the magnet releases its hold. In this way masses of iron weighing many thousands of pounds, as well as red-hot iron, can readily be moved.

The strength of an electromagnet depends on the number of turns of wire, the strength of the current and the permeability of the iron core. By the permeability of the iron core is meant the magnetic strength produced in the iron by a certain magnetizing force; the greater the permeability the more strongly will a given current magnetize the iron. The invention of an insulating covering made it possible to wind many turns of wire on an iron core and produce a strong electromagnet (see INSULATOR). This in turn made possible the telegraph relay, in which a very weak current produces sufficient magnetic force to move the armature. It also made possible the strong electromagnets used in modern dynamo-electric machinery. E.E.B.

ELEC'TROMAGNET'IC THEORY OF LIGHT. According to this theory light consists of very short electromagnetic waves, commonly called electric waves, which are transmitted through the ether (see ELECTRICITY). The wireless telegraph message is also transmitted by waves in the ether. The two kinds of waves are known to be alike in many respects; either may be reflected from a mirror surface of metal; electric waves are bent on entering certain substances as light is bent on entering water; certain substances are transparent to electric waves as glass is transparent to light. The fact that light waves and electric waves are alike in so many respects leads to the belief that they are of the same kind, the only difference being in the length of the waves. It was Maxwell's mathematical proof that electromagnetic energy is transmitted by waves of the same kind as light waves, which led to the discovery of the wireless telegraph.

The waves used in wireless telegraphy are produced by a violent electrical discharge in the air. The discharge at the spark gap of a wireless telegraph sending instrument consists, according to the electron theory, of violent motion of electrons across the gap. Light is believed to be produced also by motion of the electrons. To produce light the electrons must vibrate in a very small space with very great speed. The space in which the electron vibrates is equal to that occupied by an atom. The speed is so great that the electron to produce light that is just visible (red light) must make about as many vibrations in a second as there are seconds in twelve million years. We know this because we know the number of light waves produced in one second and it requires one vibration for each wave. To produce white light the electron must vibrate much faster. Heating an object sets the electrons vibrating violently and thus causes them to send out very short electromagnetic, or light, waves. In this manner heat produces light.

Thus the electromagnetic theory of light and the electron theory of electricity fit together as parts of one theory and explain better than any other theory the known facts of electricity and light. E.E.B.

ELEC'TROMAG'NETISM, the branch of physical science which treats of the relations between electricity and magnetism. Whenever an electric current flows through a wire there is a magnetic field around the wire. An electric current is electricity in motion; electricity in motion is always accompanied by magnetic force.

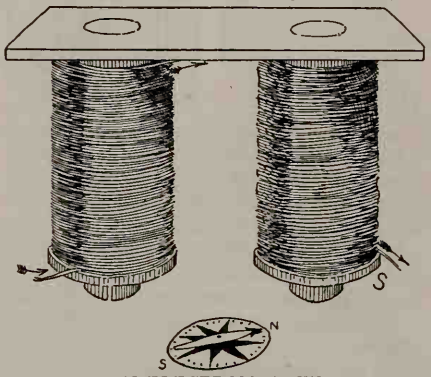
A magnetic compass placed near a wire through which an electric current is flowing tends to place itself perpendicular to the wire. If a number of magnetic compasses are placed around a wire through which an electric current is flowing, the compass needles arrange themselves in the form of a circle, showing that the lines of force are circles. If the direction of the current is reversed, the compass needles will all turn around and again point out a circle, each needle pointing in the opposite direction from the first. Reversing the current reverses the direction of the force.

A coil with an electric current flowing through it acts like a magnet. The coil has a north and a south magnetic pole, as has a bar magnet; it retains its magnetic force only so long as the current flows. If the direction of the current is reversed the polarity of the coil is reversed. If an iron core is placed in the coil the magnetic strength is increased (see ELECTROMAGNET).

If an alternating current flows through a wire the magnetic field is reversed every time the current is reversed, as the experiment with the compasses referred to above shows. In this respect the magnetic field about an alternating current differs from that of a direct current, for a direct current of constant strength produces an unchanging magnetic field. If an alternating current flows through a coil, the magnetic poles of the coil change with every reversal of the current; if a second coil is placed near the first the changing magnetic field of the first coil induces an electromotive force in the second coil.

If a magnetic compass is placed in an alternating current coil, the needle is jerked back and forth as the magnetic force changes direction, but the needle cannot turn as rapidly as the magnetic field changes. The result is that the needle is demagnetized. The effect is similar to that of hammering a magnet (see, again, MAGNET AND MAGNETISM). A magnetized watch can be demagnetized by placing it in an alternating current coil.

Another example of the magnetic action of an alternating current is found in the telephone receiver, the core of which is a permanent steel magnet. The effect of the feeble alternating current which flows through the coil is not to reverse the magnetic field, as



AN ELECTROMAGNET
With many turns of insulated wire.

with a soft iron core, but alternately to strengthen and weaken the magnetic field.

Two principles sum up briefly the relation between electricity and magnetism.

1. Electricity in motion produces a magnetic field.

2. A magnetic field in motion across an electrical conductor produces an electromotive force (which see). E.E.B.

ELECTROMETER, *e lek trom' e ter,* an instrument for measuring electrical potential. The gold-leaf electroscope indicates roughly the difference of potential between the gold-leaf and the air. Electrometers are much more sensitive than the gold-leaf electroscope. (See ELECTROSCOPE, for illustration.)

The principal forms of electrometer depend on the attraction of two disks of brass having unlike charges. A very small change in the charge causes a movement of one of the disks. The force which is required to bring the disk back to its original position is a measure of the electromotive force (which see).

In the quadrant electrometer a thin, flat piece of aluminum, called the needle, is suspended by a fiber and turns in a shallow box of brass which has been cut into four quadrants. The quadrants are electrically charged, two opposite quadrants being positive and the other two negative. The induced charges on the needle cause it to turn. E.E.B.

ELECTROMOTIVE, FORCE, *e lek' tro mo' tive,* the force which tends to cause a flow of electricity. It may be compared to the pressure which causes water to flow through

a pipe. Greater water pressure causes a greater number of gallons per minute to flow through a pipe, and in a similar way a greater electromotive force causes a greater quantity of electricity per second to flow through an electric circuit.

Electromotive force in a circuit is measured by finding the difference of pressure between two points in the circuit just as one might find the difference of pressure between two points in a water pipe. The difference of pressure between two points in an electric circuit is sometimes called *potential difference;* this term and electromotive force mean essentially the same thing. The term *electromotive force* is usually abbreviated to its three initial letters, e. m. f. The practical unit of electromotive force is the volt (which see).

The e. m. f. of a battery is the difference in the electric potential between the terminals of the battery. The e. m. f. of single cells of electric batteries is from one to two volts, depending on the kind of cell. The e. m. f. of a battery may be compared to the pressure produced by a pump. The battery is the source of electric pressure, as the pump is the source of water pressure.

When an electric circuit is open, if a battery of a dynamo or other source of electromotive force is part of the circuit, then the electromotive force tends to cause electricity to jump across the gap. If the gap is not too great there is an electric discharge, or a spark, across the gap; if a discharge does not occur it is because the electromotive force is not great enough to overcome the resistance of the air. Whenever there is a flow of electricity along a conductor or a discharge of electricity through a non-conducting substance the cause is an electromotive force.

Very high electromotive force is used in transmitting electric currents over long distances. Such currents are called *high tension currents.* The e. m. f. of the ordinary electric lighting circuit for houses is from 110 to 120 volts.

In every-day electrical parlance electromotive force is often called *voltage drop,* particularly in referring to the difference of potential between two points on a single wire. Thus it may be said that the voltage drop of a certain trolley line is ten volts, meaning that the difference of electric pressure between the end of the line at the power house and the farther end of the line is ten volts. In this case the e. m. f. between the trolley line and the earth might be, for example, 550 volts at the power house and 540 volts at the farther end of the line, the difference being ten volts. When a car starts from the end of the line nearest the power house, in the example we are considering, the e. m. f., or the voltage drop, from the trolley to the track is 550 volts. When the car has reached the farther end of the line this e. m. f. is 540 volts. It is the e. m. f. between the trolley wire and the track that causes a current to flow from the trolley to the ground through the motor which runs the car. E.E.B.

ELECTRON, *e lek' tron.* See ELECTRICITY.

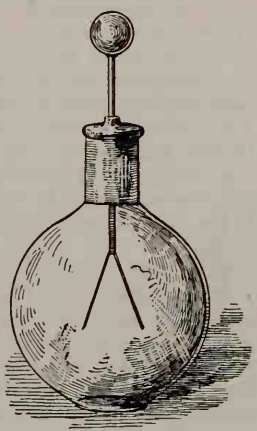
ELECTROPLATING, *e lek' tro playt ing,* the process of depositing a coat of gold, silver, nickel or other metal on a cheaper metal by means of an electric current. This method has almost completely superseded the old Sheffield method, in which the metals were welded together at a high temperature. In electroplating, the article to be plated is immersed in a solution of the desired metal, through which an electric current is then passed. The solution is decomposed by the action of the current (see ELECTROLYSIS), and fine particles of metal are deposited on the article to be plated. The longer the article is a part of the electric circuit the heavier will be the deposit. If several layers of metal are deposited, the article is known as *triple-plated* or *quadruple-plated.*

Electroplating is also used to make reproductions of medals and other metal pieces. First a mold or cast of the original must be made; this cast may be of some cheap metal, or it may be of wax or gutta-percha. This mold is carefully rinsed in an acid or caustic alkali solution, and then rinsed again in cold water. The mold may then be immersed in a solution of gold or other metal, as explained above.

The solutions in commercial use are numerous, but for gold, a solution of gold cyanide and potassium cyanide is commonly used, and for silver, a solution of silver cyanide and potassium cyanide. Platinum, zinc, copper and brass are among the other metals commonly used in electroplating. A special application of the principles of electroplating has been made to printing; by this method, type, engravings and etchings may be reproduced indefinitely. See ELECTROTYPING.

ELECTROSCOPE, *e lek' tro skope,* an instrument used for detecting the presence and nature of an electric charge. A simple electro-

scope can be made by suspending a pith ball by a silk thread from a glass support. If a body charged with positive electricity is brought near the ball the latter will be attracted to the object, become itself positively charged, and then be repelled. A much more sensitive instrument consists of two slender strips of gold leaf, suspended in a glass bottle from a metallic rod (see illustration). The rod extends through the cork of the bottle and terminates in a knob. If an object charged with electricity is brought near the knob the leaves become electrified, and since like charges repel each other, they fly apart and hang like a *V* upside down. Remove the object and the leaves resume their vertical position.



ELECTROSCOPE

The electroscope is said to be charged when the electrified object is placed in contact with the metallic knob. In that case the leaves separate and remain apart. If a positively-charged body is brought near a positively-charged electroscope, the leaves will fly farther apart, but if the object has a negative charge they will fall toward each other. In both instances they resume their original charged positions when the outside electrified object is removed. The electroscope may be *discharged* by touching the knob with the hand, causing the leaves to collapse. Thus the electroscope may be used to determine the nature of the charge of any body brought near to it.

ELECTROTYPING, *e lek' tro type ing,* the process of making metal reproductions of type, engravings or etchings, by applying the principles of electroplating. The type or other matter to be plated is first carefully cleaned and then dusted with finely-powdered graphite. An impression of the type or engraving is then taken on a sheet of beeswax, which is coated with powdered graphite to make it a conductor of electricity. The next important step is to suspend the wax mold in a bath, usually composed of two parts of sulphate of copper and one part of sulphuric acid slightly diluted in water. The negative pole of a battery is then connected with the wax mold, and the positive pole with a sheet of copper hung in front of the mold.

When the electric circuit is thus completed the copper is drawn from the plate and deposited on the wax. After several hours a thin shell of copper is found adhering to the wax. This shell is then backed up with lead or type metal to a standard thickness, and when the metal has cooled the back is planed smooth. The edges are then beveled, and the plate is ready for the press.

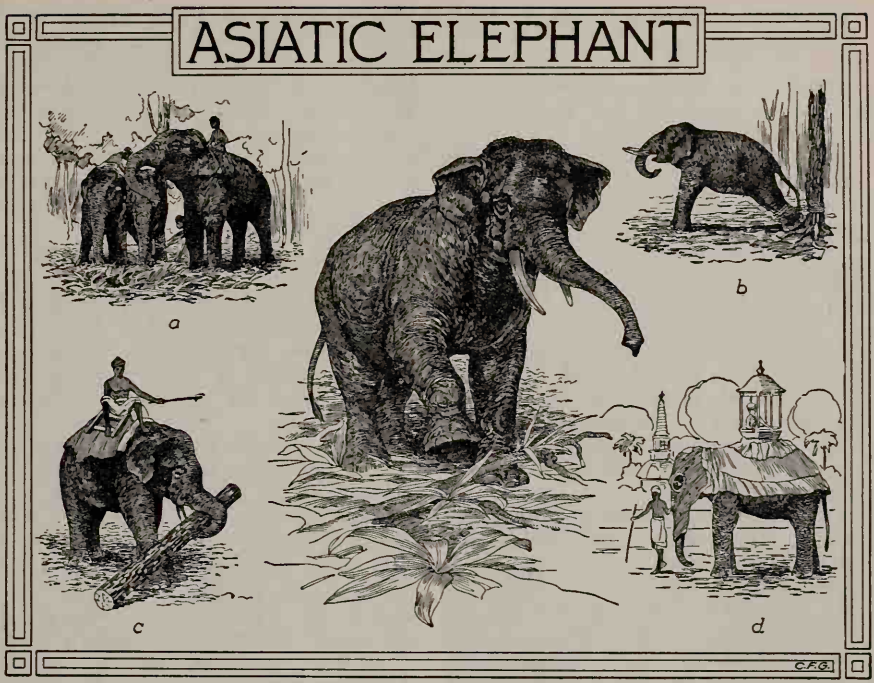
There are a number of minor variations possible in this process. Some electrotypes are made directly from the original plate, without the use of a wax mold. The surface of the original is first washed with a very weak solution of wax in turpentine, to prevent adhesion, and is then immersed in the copper sulphate bath. The thin copper shell formed on the original may then be used in turn as an original and an electrotype may be made from it. A wax-mold is supposed to give better results than this method, but the untrained eye cannot distinguish between the two kinds of electrotypes.

ELEGY, *el' e ji,* a poem in which the prevailing tone is that of melancholy. In English poetry the elegy is usually a lamentation over the death of a loved one, or a meditative poem whose mournful theme is inspired by the thoughts of death. Shelley's *Adonais,* in which the poet expresses his grief at the loss of his beloved friend, John Keats, is one of the most beautiful elegies of the former class. Another admirable example is Lowell's *Threnodia,* a tribute to his little son.

The greatest elegy of the meditative type in English literature is Gray's *Elegy Written in a Country Churchyard.* In this the poet passes from his contemplation of evening and the graves of the dead to a general reflection on the nature of human life, which is summarized in the famous lines:

The boast of heraldry, the pomp of power,
And all that beauty, all that wealth e'er gave,
Await alike the inevitable hour:—
The paths of glory lead but to the grave.

Still another form, known as the *pastoral* elegy, is illustrated by Milton's *Lycidas,* where the poet's sorrow over the loss of a friend is given a background of rural narrative. The Greek elegy was a short poem written in stan-



(*a*) Decoy (tame) elephant coaxing wild one into position in stockade so it can be tied. (*b*) Wild animal securely fastened prior to undergoing the ordeal of taming. (*c, d*) Tamed elephants at work.

zas of two lines each, in which lines of five feet and six feet alternated (see METER). The Romans applied the term *elegy* to love poems of the type written by the great lyric poet Catullus.

ELEMENTS. See CHEMISTRY, subhead *Elements.*

ELEPHANT, *el'e fant,* a huge, clumsy-looking animal with long, flexible trunk, large flapping ears, and rough, wrinkled hide of dark gray. It is the children's favorite in circuses and zoölogical gardens. The elephant is the largest land animal of the world to-day. There are two existing species, the African and the Indian.

General Characteristics. The body of an elephant is very bulky. The legs are thick and almost straight, and covering the toes are hooflike nails. Set on a short, thick neck is a very large head from which extends that source of wonder, the long tapering trunk, or proboscis. This trunk, six to eight feet long, is an extension of the nose and upper lip, and the nostrils run all the way through it to the tip, which is extremely sensitive. As the trunk is provided with nearly 40,000 very strong muscles, it can be turned and twisted in every direction and can be used as a weapon of defense or offense. Its chief use, however, is to obtain food and to carry it to the mouth of the animal. An object as small as a peanut can be picked up by the sensitive tip, or a large bunch of hay can be hooked up to be eaten. The trunk is also used to draw up water, which is poured into the mouth, and it likewise sounds the animal's loud trumpet call of anger or alarm. Valves in the trunk prevent food and water from going in farther than necessary to hold them on the journey to the mouth. As it is the seat of the keenest sense, that of smell, the trunk may be carried high in the air or close under the body in times of danger, as a means of protecting the organs.

The eyes of elephants are small and their sight is poor, but the sense of hearing is very acute, the ears, which hang downward, being large. The tail is short, slender and somewhat hairy. Covering the body is a thick, coarse hide, with only here and there a few hairs.

The cutting teeth (incisors) on either side of the upper jaw of elephants develop into long tusks, which are used for grubbing food or employed as weapons, and sometimes for carrying articles. Tusks vary in size, sometimes being quite small, but in well-grown males ofttimes weighing 200 pounds. The best ivory of commerce, used for billiard balls, chessmen and piano keys, is made of elephants' tusks. See IVORY.

Elephants grow from nine to fifteen feet high and weigh 4,000 to 10,000 pounds, or about four to ten times as much as the average horse. Although an elephant's head is large and its forehead broad, its brain is comparatively small; yet the animal shows much intelligence and can be taught. It is trained for many uses, as it can carry about a ton's weight at the rate of four miles an hour, in climates where horses could not be used as beasts of burden.

Differences between African and Indian Elephants. African elephants are larger, stronger and more fierce than those of Asia. Their hide is tougher; their ears are longer; they have three and four toes instead of five; the teeth are differently constructed, and both sexes have tusks, whereas only the male Indian elephant bears those weapons. The back of the African elephant slopes decidedly from shoulders to rump; the backs of the Indian species are straighter. African elephants have longer trunks than the Indian species, the trunks sometimes being so long they drag on the ground. Trunks of the Indian species end in a more flexible, fingerlike extension. Mountainous districts with scattered growths of trees are the favorite homes of African elephants, while Indian species delight in thickly-forested mountainous places. The smaller Indian species is the kind usually seen in menageries and at the circus, but the well-remembered mammoth *Jumbo* of Barnum's circus, the largest elephant ever taken into captivity, was brought from Africa.

African elephants are valued only as "big game" and for what the dead body yields—hides for native shields, flesh for food and, most important, the ivory tusks for weapons and as articles of commerce. But in India the living elephants also play important parts. At one time they took part in wars of the East, having been taught to fight with a kind of sword carried in the trunk. They are now trained in Asia for use in war to drag guns and to carry baggage. In India, especially, they are the tourists' delight, for they are a means of conveyance, carrying passengers in pavilionlike structures called *howdahs,* fastened to their backs. With the construction of new roads, however, elephants are now less used for that purpose. They are also used in many kinds of labor, such as rolling and carrying logs, fording streams with heavy burdens, etc., and in all their tasks show adaptability and understanding.

Elephants are also used in hunting tigers in India, the hunters being carried on the elephants' backs and shooting from that elevated and comparatively-safe position. Native rulers, the *rajahs,* keep elephants for traveling, and a rare species of white elephant is particularly valued for processions of Eastern princes.

Habits. Elephants are gregarious, or social, animals; that is, they live in large-sized herds. However, the old males, if they become very ferocious, are sometimes driven out and must live alone. In the jungles elephants feed at night on fruits, leaves of certain trees, barks of others, and on roots and cocoanuts. In captivity 600 pounds of fodder a day, preferably hay, are required, besides smaller amounts of sweet potatoes, sugar cane and rice. As they suffer keenly from the heat of the sun, during the daytime they rest in the shade or wallow in some stream. To lie down, an elephant must stretch its legs backward as if kneeling, so it does not often do that, but usually sleeps standing or leaning against a tree. As Shakespeare says in his *Troilus and Cressida:*

> The elephant hath joints, but none for courtesy; his legs are legs for necessity, not for flexure.

Female elephants bear usually one calf, but sometimes two. Calves suckle with their mouths, not their trunks, for about two years. When elephants are in captivity, however, they do not as a rule breed, and new captures must be made to increase or renew the stock. It has been estimated that an elephant will live about 150 years in natural surroundings.

Capture. Wild elephants are caught in various ways. Sometimes pits are dug into which the animals fall. The usual method, however, is by surrounding a herd with men on tame elephants and with beaters, and driving them into a large enclosure called a *keddah.* When the opening to the enclosure is neared, with great shouting, blowing of horns and beating of tom-toms the wild herd is crowded into

the enclosure, and the gates of tree trunks are closed. For a while the imprisoned animals dash about ferociously, but when they have quieted down somewhat, trained elephants with their drivers enter, and each wild animal is roped or fastened to the wall of the keddah or to a strong tree. Before long, through hunger and thirst, they become submissive and then may be tamed and trained.

Elephants of Long Ago. Since earliest times elephants have been known and trained for service. Egyptian monuments show representations of these beasts being led into Egypt. King Porus, when fighting Alexander the Great in Northern India, had war elephants in his army. With an army of elephants Hannibal inspired terror on his invasion of Italy. So, for centuries they have been used, and still plod patiently for their masters in many regions. Although usually gentle in captivity, they must be carefully watched for sudden displays of temper. With their powerful trunks they can encircle the waist of a man and hurl him to the earth with such violence as to kill him instantly. The fossil bones of two great extinct animals related to the elephant, the mammoth and the mastodon, are frequently found in Europe and America. See MAMMOTH; MASTODON. V.L.K.

ELEPHANTIASIS, *el e fan ti' a sis,* a name given to two diseases common in the Indies and other warm countries, so called because the skin of the sufferer becomes rough, in slight degree like the hide of an elephant. One is *leprosy* (which see); the other is the elephantiasis sometimes known as *Barbados leg.* The disease comes on slowly, one attack followed by another, and after each attack some part of the body, usually the leg, grows larger and larger, often reaching a startling size. Sometimes it is necessary to cut off the affected part. It is caused by the presence of a threadlike worm under the skin, which may have been transmitted by a mosquito. Change of climate and quinine will cure some cases. Lying in bed with the affected part elevated, and careful treatment by massage, elastic bandages, etc., will bring relief.

ELGIN, *el' jin,* ILL., a city famous for its manufacture of watches and as a butter market, is situated in the northeastern part of the state, in Kane County, thirty-seven miles west of Chicago. It occupies an area of about seven square miles along the Fox River. The population, almost entirely American, was 25,976 in 1910 and 28,203 in 1916. Elgin is on the Chicago, Milwaukee & Saint Paul and the Chicago & North Western railroads, and is connected with other railroads and the surrounding towns by interurban lines.

Industries. Dairying is extensively carried on throughout the fertile farm country about Elgin, and this occupation has made of that city one of the most important butter markets of the world. Current quotations of the Elgin Board of Trade, operating under a decree of the United States courts, establish the market price of high-grade butter throughout the United States. A great condensed milk company is one of the oldest manufacturing plants in the city, and its trade is world-wide. The Elgin National Watch Company, the city's largest industrial establishment, produces 3,000 watches daily. Elgin watches are well known in every part of the civilized world. Among a long list of other manufactured articles produced at Elgin are butter tubs, shoes, pipe organs, automobiles, coffin fixtures, rugs, lumber and sheet-metal products. More than 120 manufacturing industries give employment to over 8,000 people, and the annual pay roll aggregates nearly $10,000,000. The D. C. Cook Publishing Company and the Brethren Publishing Company are two well-known houses located here.

Public Buildings and Parks. Elgin is frequently called the *City of Churches,* in recognition of many handsome church edifices. Among many other prominent buildings are the fine city hall; the post office, erected at a cost of $150,000; the Gail Borden Public Library; the Y. M. C. A. and Y. W. C. A. buildings and the Masonic Temple. Lord's Park, located a little more than a mile from the center of the city, covers seventy-five acres and contains a number of small lakes, a pavilion, zoo and museum. Wing Park, containing 112 acres, has a fine golf course; Central Park is a small, attractive park close to the business district.

Institutions. In addition to its public schools, important among which is the high school building, erected in 1909 at a cost of $350,000, Elgin has the Elgin Academy of Northwestern University, Saint Mary's Academy (Roman Catholic) and a number of business colleges and music schools. Sherman Hospital, with its nurses' training school, is owned and conducted by the Elgin Women's Club. Saint Joseph's Hospital is in charge of the Sisters of Saint Francis. The Northern Illinois Hospital for the Insane, which accommodates

1,800 patients, was opened in Elgin in 1872. The Larkin Children's Home is supported entirely by voluntary contributions of citizens.

History. In Villa Street Park is a natural stone, marking the spot where the first white settlers, two brothers from New York state, erected a log house in 1835. The town was laid out in 1836 and chartered as a city in 1854. The commission form of government was adopted in 1912. The city water supply is obtained from artesian wells. E.H.K.

ELGIN, *el'gin,* JAMES BRUCE, Eighth Earl of (1811-1863), a British diplomat and colonial administrator, Governor-General of British North America from 1847 to 1854 and Viceroy of India for the last eighteen months of his life. Both in Canada and in India his work was constructive, and in both of these great British dependencies he had to proceed along untried lines; in Canada he was the first Governor-General to put into practice the principles of responsible government, and in India he was the first Viceroy appointed directly by the Crown. Elgin was the second son of the seventh Earl of Elgin, who is best remembered for his zeal in gathering a collection of sculpture and marble fragments from the Parthenon and other buildings in Athens. These have world-wide fame as the *Elgin Marbles* (see below). The son was sent to Eton and in due course to Christ Church, Oxford. There he was one of a small group, several of whom later became famous. One of them was William Ewart Gladstone.

EARL OF ELGIN

In 1841 Elgin, then merely James Bruce, entered the House of Commons as a Conservative, but before the end of the year the death of his father made him Earl of Elgin; the earldom was a Scotch peerage, which compelled him to retire from the House of Commons but did not entitle him to sit in the House of Lords. For the moment he had no opening for activity. Early in the next year he accepted the position of governor of Jamaica, where he remained four years, won the respect of all classes and improved the condition of the negroes. Almost immediately after his return to England in 1846 he was offered and accepted the Governor-Generalship of British North America. After his appointment but before his departure for this wider field he married Lady Mary Lambton, daughter of the Earl of Durham.

As the son-in-law of the popular Earl of Durham, Elgin was warmly received in Canada, but he had many difficulties to face. According to one of his biographers he laid down for his own guidance certain broad principles; that he should identify himself with no party, but make himself a mediator between the influential men of all parties; that he should retain no ministers who did not enjoy the confidence of the assembly or of the people; and that he should not refuse his consent to any measure proposed by his Ministry, unless it should be of an extreme partisan character such as the assembly or the people would be sure to disapprove. These principles are to-day accepted as commonplace, but in 1847 they were startling, and in 1848, when Baldwin and Lafontaine were summoned to form a Ministry, they were first actually put into practice. Responsible government, for which Canadians had fought for a generation, was an accomplished fact.

The Baldwin-Lafontaine Ministry introduced the Rebellion Losses Bill in 1849. This bill, which was really the conclusion of work done by previous governments, met violent opposition, both in Canada and in England, because it provided compensation for damages caused in the Rebellion of 1837, even though inflicted by persons in authority. The bill was approved by Elgin, in spite of great pressure brought on him to withhold his signature. On leaving the Parliament buildings in Montreal after signing the bill, Elgin was jeered and threatened by a mob, and on the evening of the same day, April 25, 1849, the Parliament buildings were burned to the ground. That Elgin's course met the approval of the British government, however, was shown shortly afterward when he was elevated to the English peerage as Baron Elgin.

After the excitement caused by the passage of the Rebellion Losses Bill had subsided, Elgin's frank and genial manners were of great service in restoring good feeling, and before very long he was generally spoken of as the most popular man in Canada. The chief event of the administration thereafter was the signing of a reciprocity treaty with the United States. After the negotiations had continued for nearly six years, Lord Elgin and Francis

Hincks finally went to Washington, D. C., and in a few weeks settled the terms, which included free trade in the natural products of the farms, forests, mines and seas. This treaty was abrogated by the United States in 1866.

At the close of 1854 Lord Elgin returned to England, his successor in Canada being Sir Edmund Walker Head. He lived quietly for two years, but in 1857 was sent to China on an important mission. He was then a member of the British Cabinet for a short time, and in 1859 was again sent to China as special ambassador to force Chinese compliance with certain British demands. He was successful and almost at once after his return to England, early in 1861, was appointed to the Viceroyalty of India. He was the first Viceroy after the great Indian Mutiny of 1857 and the first to hold his office directly under the control of the British government. Unfortunately he died before he could leave a sharp impress on the organization and policy of the Indian government. It is interesting to note that his son Victor, ninth Earl of Elgin (1849-), was Viceroy of India from 1894 to 1899. W.F.Z.

ELGIN, *el'gin,* **MARBLES,** a splendid collection of sculptures, mainly from the Parthenon in Athens, which was purchased from Lord Elgin by the English government in 1816 for $175,000 and placed in the British Museum in London. When Lord Elgin, who was very fond of art, was appointed British ambassador to Constantinople, he made plans to collect some of the ruined statues of the neighboring Greeks. During the year 1801 he worked steadily at the Parthenon (which see), gathering the principal figures from the pediments; he secured fifteen square slabs, called *metopes,* each decorated with two figures, and fifty-six slabs from the famous frieze. In addition he collected one of the Caryatids from the Erechtheum, part of the frieze of the Temple of Nike and numerous fragments, all of which he shipped to England.

The people in his native country either thought little of the collection or denounced him as a robber, until some of the prominent critics on art pointed out its wonderful historical and artistic value, for much of this work was done by the famous Greek sculptor Phidias. Even Lord Byron in *Childe Harold* mourned over "the walls defaced, the moldering shrines removed by British hands." In reality it was the best thing that could have happened to preserve this sculpture, for the Turks later overran the land and burned much of the marble to make lime for mortar, and probably these beautiful works of art would have met that fate. See PARTHENON; SCULPTURE.

E'LI, a high priest and judge of the Israelites for forty years, who took care of Samuel during his boyhood. Deeply pious himself, he was not a firm enough father to train his two sons to follow God, and for that reason he was warned that they would die in battle. When the news of their death was brought to him, he was also told that the Ark of God had been taken, and this shock killed him. See *I Samuel* IV, 18.

ELI'JAH, the great prophet-reformer of Israel, whose sole object was to awaken his people to the conviction that Jehovah alone is God. He lived at a period when there was a life-and-death struggle between the religion of Jehovah and Baal worship, because Ahab, king of Israel, had introduced the worship of other gods. By miracles and prophecies Elijah proved God's divinity and denounced the king for his crime, telling him that Jehovah would punish him. In *II Kings* II, 11, it is recorded that during the reign of the next king, Elijah was carried to heaven in a fiery chariot, after appointing Elisha as his successor. See ELISHA.

ELIOT, *el'iut,* CHARLES WILLIAM (1834-), one of the most renowned of American educators, for forty years president of Harvard University. Higher education in the United States since the War of Secession has been more strongly influenced by Eliot than by any other man; chiefly to him are due the introduction of the elective system, the inclusion of all branches of knowledge as subjects for study, and the maintenance of highest scientific ideals in graduate and professional departments. These new principles he fought hard to establish, and before the close of his active career he had the satisfaction of seeing them accepted as fundamental and undebatable bases of higher education.

CHARLES W. ELIOT

Eliot was born in Boston on March 20, 1834, and was graduated from Harvard College at the age of nineteen. After graduation he became a Harvard tutor in mathematics, at the same

time pursuing advanced studies in chemistry. From 1858 to 1863 he was assistant professor of mathematics and chemistry at Harvard, and then studied in Europe for two years. Besides teaching him more chemistry, these two years gave him an insight into European educational methods which was of untold value to him a few years later. He returned to Boston to accept the professorship of analytical chemistry at the now famous Massachusetts Institute of Technology, which was then being organized.

In 1869, he began his long career as president of Harvard University, which was transformed under his administration from a New England college into a national institution. From the first days of his administration he showed a remarkable grasp of educational and administrative detail, but never lost sight of general principles. His breadth of interest, personal dignity of character and high ideals, all made him a man who held the admiration and loyalty of his staff. In matters of discipline, as of study, he deliberately allowed great freedom. President Eliot was a firm believer in athletics, although he did not fully sympathize with the later development of intercollegiate competition. In his college days he was an expert oarsman, and for many years rowing was his favorite form of exercise. In his later years he rode a bicycle, and even after his seventieth year he was a familiar figure in Cambridge streets on his early morning "spin." In 1909 his advancing years led him to lay down the heavy administrative burden which he had carried for four decades; his successor as president was Abbott Lawrence Lowell.

Eliot's sanity, mellowness and wide range of interests gave his old age a unique quality. He was, in many respects, the most distinguished private citizen of the United States. His views on education, religion, economics, politics and other topics were given respectful hearing. He edited the "Harvard Classics," popularly known as the "Five-Foot Shelf" of books, a selection of the world's best literature, whose careful reading, he said, would give any man or woman a liberal education. In 1909 President Taft offered him the ambassadorship to Great Britain, but Eliot declined on the ground of age. He was from 1909 a member of the General Education Board and a trustee of the Rockefeller Foundation.

He was a frequent speaker in public, and also the writer of a number of books, among them a *Manual of Qualitative Chemical Analysis; Five American Contributions to Civilization and Other Essays; Educational Reform; The Happy Life; The Durable Satisfactions of Life; Four American Leaders;* and *The New Religion.* W.F.Z.

ELIOT, GEORGE (1819-1880), the pen name of MARY ANN (or Marian) EVANS, the foremost woman writer of English fiction. Together with her two great contemporaries of the Victorian Age, Dickens and Thackeray, she

GEORGE ELIOT

"Of all the women writers who have helped and are still helping to place our English novels at the head of the world's fiction, she holds at present unquestionably the highest rank."—*Long.*

has an assured place among those novelists who have helped to give English fiction its commanding position in the world's literature.

Marian Evans was born on November 22, 1819, at Arbury Farm, in Warwickshire, one of the Midland counties, about twenty miles from the town of Stratford, where Shakespeare was born. Her father, a plain, honest farmer of the type seen in the hero of *Adam Bede,* was agent for Mr. Francis Newdigate, and on his Arbury estate the novelist passed the first twenty-one years of her life. Some of the most interesting descriptions of scenery, character and incident that brighten her novels are reflections of her life in the English Midlands. She and her brother are pictured in *The Mill on the Floss* as Maggie and Tom Tulliver; the saintly Dinah Morris in *Adam Bede* is one of her aunts; and the sharp-tongued Mrs. Poyser, in the same book, her mother.

After studying for several years at two pri-

vate schools for young ladies, Marian, at the age of seventeen, was called by the death of her mother to take entire charge of the household. In the midst of the cares and responsibilities of her new duties, however, she found time for a vast amount of miscellaneous reading. When she was twenty-one the family removed to the thriving manufacturing town of Coventry, where she formed a new circle of friends. Her most intimate associates were freethinkers in matters of religion, and under their influence she turned aside from her youthful convictions and became a freethinker herself. This was the beginning of a spiritual struggle that left her convinced that duty is the supreme law in life, an idea that finds expression in all of her novels.

In 1849, on the death of her father, she traveled on the Continent with friends, and after her return to England began to write for the *Westminster Review*. She was soon made assistant editor of this magazine, an event which marks the real beginning of her literary career. Herbert Spencer, Carlyle, Harriet Martineau and George Henry Lewes became her close personal friends, and with the latter, himself a writer of some distinction, she formed a friendship that both regarded as marriage. Under the inspiration of his sympathy and companionship she sent to one of the magazines, in 1857, her first story, *The Sad Fortunes of the Reverend Amos Barton*. This simple tale of the trials of a poor clergyman and his noble-hearted wife was published the following year with several other stories under the title *Scenes of Clerical Life*.

In 1858 appeared her first long novel, *Adam Bede*. It was received by the public with an enthusiasm for which its author was quite unprepared, and it has always remained one of her most popular books. Certainly it is one of the most natural and unlabored, for it is comparatively free from the analysis of character and motive that is carried to an extreme in her last novel, *Daniel Deronda*. In realistic portrayal of country life and character *Adam Bede* is probably surpassed by no other book. Then followed *The Mill on the Floss* (1860), in which she reached the heights of beautiful expression, picturing with a tender and loving touch her own girlhood experiences.

Silas Marner, the most perfectly-constructed of her novels, was published in 1861. In this is revealed the miracle wrought in the life of a hermit weaver who has lost faith in humanity and who is reclaimed by the loving influence of a little child. *Romola* (1862-1863), her only historical novel, marks a change in background, for it is a picture of Italian life in the days of the great Savonarola. In *Felix Holt* (1866), *Middlemarch* (1871-1872) and *Daniel Deronda* (1876), she returned to English scenes and characters. Meanwhile, in 1868, she had produced a dramatic poem in blank verse, *The Spanish Gypsy*. Her last work, a collection of essays entitled *The Impressions of Theophrastus Such*, appeared in 1879, the year after Mr. Lewes died. His death was a terrible shock to her, and it meant the end of her creative vitality. Two years afterward she married John Walter Cross, who later became her biographer. She lived only six months after their marriage.

In George Eliot's novels there is more of tears than of laughter. She viewed life seriously, and the spiritual struggles of her characters, their development or their degeneration, were matters of supreme interest to her. Yet her novels are not all gloom. Her famous chapter in *Silas Marner* which describes the village worthies sitting about the tavern fire and philosophizing on ghosts is one of the brightest examples of humorous writing in English fiction. One of the strongest elements in her personal character was her craving for love and sympathy. Again and again this is reflected in the tender note that may be found in all of her stories, a tenderness which is nowhere more beautifully expressed than in the simple words which tell the tragic fate of Tom and Maggie Tulliver:

> The boat reappeared, but brother and sister had gone down in an embrace never to be parted; living through again in one supreme moment the days when they had clasped their little hands in love and roamed the daisied fields together.
>
> B.M.W.

ELIOT, JOHN (1604-1690), an American colonial missionary, called the "Apostle to the Indians," was of English birth and was graduated from Cambridge in 1622. He settled in Boston in 1631, where he devoted his life to bettering the condition of the Indians. His first step in this direction was to master their dialects, which he accomplished with the assistance of a young Indian convert. Besides his successful missionary labors he did much literary work of lasting value. His great life achievement was the translation of the Bible into the Massachusetts dialect of the Algonquin tongue. He also published an Indian grammar and assisted in the production of the *Bay*

Psalm Book, an English metrical version of the Psalms, the first book printed in New England.

ELI'SHA, a great prophet of Israel who, as successor of Elijah (which see), continued and carried forward the work which he had begun. He petitioned for a double portion of Elijah's spirit as he saw him carried up to heaven in the fiery chariot (*II Kings* II, 11), and many miracles of power and knowledge were performed by Elisha in the name of the Lord. He held his office for sixty-five years and was the last prophet to work miracles among the people of Israel.

ELIX'IR, from the Arabian *el ik sir,* or philosopher's stone, is in modern medicine a spicy, sweetened preparation or tincture used in medicine to disguise its disagreeable taste. In alchemy, or the chemistry of the Middle Ages, it was a substance which was supposed to have the property of changing the baser metals into silver or gold, of restoring youth and prolonging life. The word is also used figuratively in its modern sense, as in Bayard Taylor's *Lands of the Saracen,* "The air we breathed was an elixir of immortality."

ELIZ'ABETH (1533-1603), the "Good Queen Bess" of England, whose reign was one of the most glorious periods in the history of her

ELIZABETH

country. Adored in her own day as almost more than mortal, she has not lacked severe critics in the years that have followed, but as to the importance of her reign there cannot be two opinions. In literature the names of Shakespeare, Bacon and Spenser made it of surpassing worth; daring mariners sought new shores, and by their accounts stirred the imaginations of those at home; the beginnings of the colonial empire were made, and living conditions were so changed for the better that England was like a new country. Indeed, it was the transition time from medieval to modern England, and for most of the great advance Elizabeth was given the credit, justly or unjustly.

The Religious Question. Elizabeth was the daughter of Henry VIII and the famous Anne Boleyn (which see), and was declared heiress to the crown almost immediately after her birth. But when the queen fell from favor and was beheaded, the young princess was declared illegitimate and for a time had an unhappy life. Finally, however, she was given her place in the succession, after Edward and Mary, and during Edward's reign she lived a peaceful life. While Mary was on the throne she was more or less an object of suspicion, for it was well known that she had been brought up a Protestant, but at Mary's death in 1558 her right to the crown was unquestioned. The great issue confronting her was that of religion, and she showed herself capable of dealing with it wisely. She restored Protestantism, reinstated the English Book of Common Prayer and asserted the royal supremacy over the Church, but she avoided fanaticism and showed herself willing to call to her aid Catholic as well as Protestant ministers. Indeed, one of the things which most clearly showed Elizabeth's wisdom was her choice of councillors. She might object violently to their advice, but if they could once convince her that it was for the good of the country she usually yielded. Greatest of her ministers was Sir William Cecil (Lord Burleigh), in whom for forty years she placed implicit confidence.

The Marriage Question. One of the questions on which Elizabeth's first Parliament approached her was that of her marriage—there must be, they felt, a successor to the crown, or it might come into the hands of a Catholic. For a time Elizabeth played with the question. She would marry—then she would not; so all her life she was a coquette, yearning for love and flattery. She had her favorites, notably the Earl of Leicester, whom she would probably have married had she not feared the displeasure of her subjects; and she kept foreign princes, as Philip II of Spain and the Duke

of Anjou, waiting long for an answer to their suits, but in the end she announced her intention to live and die a virgin queen.

Mary, Queen of Scots. With this fascinating princess were connected many of the political events of Elizabeth's reign (see MARY STUART). Fleeing to England to seek the protection of Elizabeth, she was there imprisoned, and in 1587 was executed because of her supposed share in several Catholic plots. Elizabeth consented reluctantly to the death of her cousin and to the stern measures against Catholics which followed, but her reluctance did not save her from the wrath of the strongest Catholic sovereign of Europe—Philip of Spain, her former suitor. He determined to punish England, and dispatched the great Armada (which see), but the storms of the Channel combined with the superior seamanship of the British to destroy the great enemy fleet, and the result was new glory to England and its queen.

Character. Elizabeth was ludicrously vain, and had a violent temper which she did not hesitate to show by swearing, striking her courtiers, or spitting at them. In the diplomacy of the day, which consisted largely of intrigue and double-dealing, she was a master, winning by her ready falsehoods the doubtful praise, "She lived and lied for her country." But one thing counterbalanced all these undoubted faults in the eyes of her subjects—her love for England. This was genuine, and it was so strong that she was willing to sacrifice even her own preferences to it. A.MC C.

ELIZABETH, N. J., the county seat of Union County, two miles west of Newark Bay, four miles southwest of Newark and twelve miles southwest of New York City. It is served by the Central of New Jersey, the Pennsylvania and the Lehigh Valley railroads and by electric interurban lines, and has steamboat connection with New York City. In 1910 the population was 73,409; in 1916 a Federal estimate reported 86,690. The area of the city exceeds nine square miles.

Elizabeth is an old town and contains many places of historical interest; a number of colonial buildings are still standing. The streets are wide, well paved and shaded. The city has many attractive suburban homes of New York business men, and contains several parks, the county courthouse, city hall, public library, an orphan asylum and several hospitals Elizabeth Port, a part of the city, is situated on Staten Island Sound and is an important reshipping point for iron and anthracite coal from the mines of Pennsylvania. The city has a large sewing-machine factory, shipbuilding plants, foundries, oil refineries, leather and rubber works, and manufactories of wire and cable, chemicals, paints, tools, electromotors, castings, machinery, hardware and tools. In favorable years the total value of factory products is over $29,000,000.

Elizabethtown, as it was first called, was settled in 1664 by a company from Long Island, and was the capital of the colony from 1755 to 1757. It was the early home of both Alexander Hamilton and Aaron Burr. During the War of Independence it was partially destroyed. Princeton University was founded at Elizabeth in 1746 as the College of New Jersey. M.W.

ELIZABETH CITY, N. C., a port of entry and the county seat of Pasquotank County, situated in the extreme northeastern part of the state, fifty-three miles south of Norfolk, Va., with which it is connected by the Norfolk Southern Railroad. Steamboats ply between the two cities through the Dismal Swamp Canal and the Albemarle and Chesapeake Canal. In 1910 the population was 8,412; in 1916 it was 9,710.

Elizabeth City is the seat of a state normal school for negroes and of the Atlantic Collegiate Institute, and has a United States customhouse. The trucking interests are extensive, and the city has a good harbor and a large domestic trade in cotton, lumber, fish and oysters. It has shipbuilding yards, cotton and hosiery mills, cotton gins, machine shops, iron works, lumber mills, and manufactories of carriages and wagons, barrels and baskets. It was settled and incorporated in 1793.

ELK, a splendid game animal of the deer family which, because of the ambition of hunters, is rapidly becoming extinct. There are two distinct species, the American and the European.

The American Elk, so named by early settlers, is more properly known by the Indian name *wapiti,* for its resemblance to European species, from which the name elk originated, is not close. Although it is rarely seen, and then chiefly in the Rocky Mountains and other westward ranges, the memory of this noble animal is preserved throughout America. Mountains, lakes, rivers, counties and towns where it was hunted for its teeth, horns, flesh or hide, have been named in its honor.

It is a strong-limbed, sleek-coated creature, standing about five feet four inches high at the shoulder, sometimes weighing 1,000 pounds.

The body is yellowish-brown above and nearly black beneath. The chest, neck and legs are dark brown. The males bear antlers which are between four and five feet long. They curve outward and backward, but their branches or tines turn forward. The male appropriates a number of females, and when mating time comes each male fights furiously with his rivals to acquire a herd. Female elks breed when two or three years old, and usually bear but one fawn at a time, although sometimes there are two or three. Unlike most deer, elk do not roam about at night. They feed on grasses, weeds, leaves and twigs during the morning and afternoon. In hot weather they spend hours at a time standing in water, to be rid of flies and mosquitoes. The winter feeding grounds are open hills.

While the wapiti enjoyed the freedom of the plains, Indians killed great numbers for the flesh, which they ate, and for the skins, which they used to cover their lodges or tepees. In the past, the elk was also hunted for its teeth and antlers. The teeth were used as badges or symbols of membership by the Benevolent and Protective Order of Elks (see ELKS) and the demand was so great that vast herds of animals were sacrificed to obtain them. To prevent complete extermination the elk is being carefully protected by law, both in Canada and the United States. The Order of Elks now use imitation elk's teeth made of metal or composition.

The European Elk, the largest of European deer, is similar to the huge, ungainly *American moose,* with its scoop-shaped antlers. It is an easily-tamed creature and has often been used as a beast of burden, but as such it has been largely superseded by the reindeer (which see). The elk is also strongly protected by law in European countries, but it is gradually becoming extinct. Some are still seen in forests of Norway, Sweden, Russia and Prussia.

THE EUROPEAN ELK

(For illustration of the wapiti, see article DEER.)

Another species of deer, now extinct, was known as the *Irish elk.* It was a large deer, distinguished by its enormous antlers, sometimes eleven feet from tip to tip. M.S.

Related Subjects. The reader is referred to the following articles in these volumes:

Deer	Reindeer
Moose	Wapiti

ELK'HART, IND., a city in Elkhart County in the north-central part of the state, fifteen miles east of South Bend and 101 miles nearly east of Chicago. It is on the Saint Joseph River, at the mouth of the Elkhart River, and on the Chicago, South Bend & Northern Indiana, the Cleveland, Cincinnati, Chicago & Saint Louis, the New York Central and the Saint Joseph Valley railroads. There is electric interurban service west and south. In 1910 the population was 19,282; in 1916 it was 21,858. The area of the city is six square miles.

Agricultural produce of the surrounding country is shipped from Elkhart. Important industrial establishments of the city include paper mills, automobile works, bridge and iron works and manufactories of musical instruments, furniture, carriages, machinery, gas generators, telephone supplies, corsets and rubber. Power for manufacture is supplied by a dam and power house built in 1913 at a cost of $750,000. The city has attractive parks, a fine high school building and a Carnegie Library.

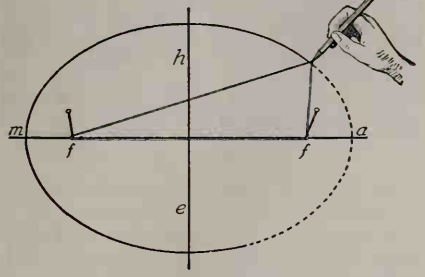
ELKS, BENEVOLENT AND PROTECTIVE ORDER OF, a social and benevolent organization founded in New York in 1868 by members of the theatrical profession, but now admitting any white male citizen of the United States of good moral character over twenty-one years of age. The order has one grand lodge and sub-lodges with club houses in many of the large cities which serve as hotels to members. An imitation elk's head, with or without the addition of the letters B. P. O. E., has, for humane reasons, replaced the elk's tooth as the official badge (see ELK). The society has a constantly-increasing membership and is said to have made greater charitable disbursements than almost any other fraternal organization in the world.

ELLESMERE, *elz'meer,* **LAND,** an uninhabited region almost entirely covered with glacial ice caps, which lies north of Jones Sound

and west of Northern Greenland. It was discovered by William Baffin in 1616, but up to 1899 very little was known concerning it. In that year Peary explored its surroundings and found that Grinnell Land, lying to the north, was a part of the same land. A year or so later Otto Sverdrup discovered its hitherto unknown west coast and several neighboring islands. See POLAR EXPLORATION.

ELLIOTT, *el'i ut,* MAXINE (1871-), an American actress who since 1908 has also been a theatrical manager and theater owner. She was born at Rockland, Maine. At the age of sixteen she moved to New York City to fight her way to success in her chosen profession. Her first appearance was in 1890 with E. S. Willard in *The Middleman.* Subsequently, she became identified with Rose Coghlan's company, and later, as a member of the Augustin Daly company, she went to London, where she was well received. In 1896 she joined Nat Goodwin's company, and to him she was married two years later, becoming his second wife, but within a few years secured a divorce. As co-star with Goodwin she appeared in a series of plays of diversified themes, produced both in England and America, embracing several Shakespearean rôles. Her first venture as an independent star was in 1903, when she appeared in *Her Own Way,* followed by *Her Great Match,* and *Myself—Bettina.* Since 1903 she has been owner and manager of the Maxine Elliott Theater in New York City. She is a sister of Gertrude Elliott, wife of Sir J. Forbes-Robertson.

ELLIPSE, *e lips',* the geometrical figure which most closely resembles in form the orbit of a planet. In geometrical terms an ellipse



AN ELLIPSE

The letters named, and the method of drawing an ellipse, are explained in the text.

is a conic section and a curve of the second order and second class. There are many mechanical appliances for drawing ellipses, called *ellipsographs,* or elliptic compasses, but the most simple method is to fasten the two ends of a piece of string at two points, called the *foci.* The string must be longer than the direct distance between the two points. With a pencil, keeping the string taut, an ellipse may be described. The diameter passing through the two foci is called the major axis; the diameter taken at right angles to this is the minor axis.

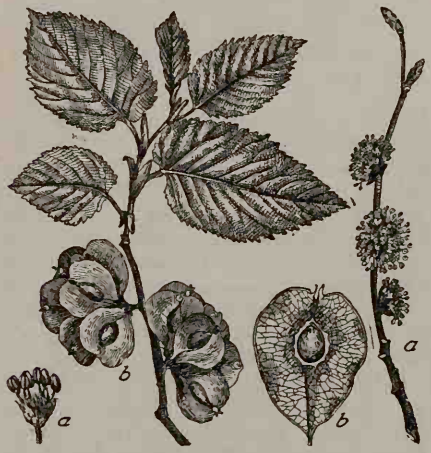
To find the area of an ellipse multiply half the length of the major axis by half that of the minor axis and multiply the result by 3.1416; this is a process that can be explained only by higher mathematics. In the accompanying figure the two *foci* are represented by *f f,* the major axis by *m a.* The minor axis is represented by *h e.* To ascertain the area assume that *m a* equals 64 feet and *h e* 48 feet. One-half of 64 feet=32; one-half of 48=24. 32×24=768. Multiply 768 by 3.1416, and the result is 2412.7488, the number of feet.

ELLIS, *el'is,* ISLAND, in New York harbor, might be called the "gateway to the New World." Through it must pass all immigrants who enter the United States through the port of New York, usually from two-thirds to three-fourths of all those who come to the country from overseas. In 1907 over a million newcomers were examined at the island for their fitness to become citizens of America, and the average number in subsequent years, until the War of the Nations in 1914, was above 700,000. After the immigrant has been accepted as a prospective American citizen he is taken upon a government vessel to the "Battery," the southern end of Manhattan Island (and therefore of the city of New York) and is then free to develop his ambitious plans in the New World.

The island is a mile southwest of Manhattan; it has been the property of the national government since 1808 and an immigrant station since 1891.

ELLS'WORTH, OLIVER (1745-1807), an early American statesman, distinguished for his sound judgment and activity at the Federal Convention, where he helped frame the Constitution of the United States in 1787. Having served in the Continental Congress for five years, and as judge in his state superior court, he was chosen to represent his state, Connecticut, at the Constitutional Convention. After the government was organized he was elected one of the first United States Senators from his state and was chairman of the committee

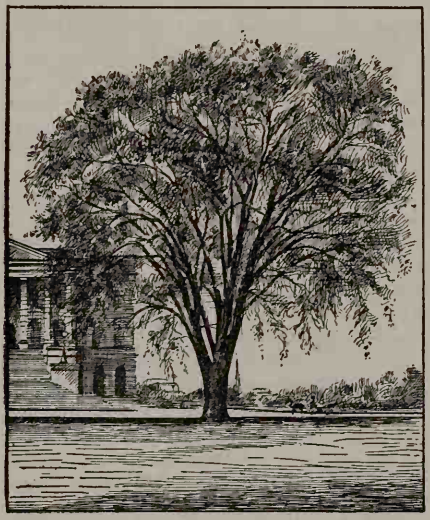
which organized the entire system of Federal courts practically as they exist to-day. In 1796 he was appointed Chief Justice of the Supreme Court. This position he held for three years, resigning to go to France with two fellow commissioners to negotiate a new treaty.



LEAVES AND SEED

(*a*, *a*) Flower stem and detail of flower; (*b*, *b*) seed body, with detail of same.

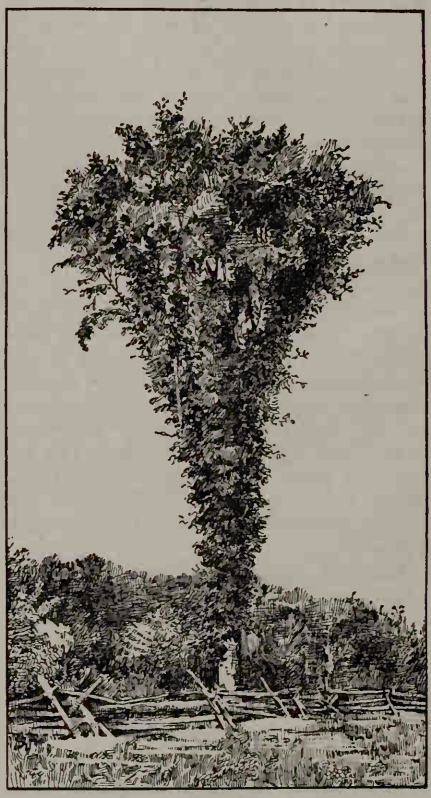
ELM, one of the "stately children of the wood," a tree valued for lumber and for ornament in America and Europe. The best-known species are the American and the English elm.



UMBRELLA FORM

Planted in Washington by the first President, and still standing near the Capitol.

The most common form in which they grow is the vase form, spreading out gradually from the base; another is the umbrella form, a long trunk branching out at the top much like a feather duster. Both forms are illustrated in accompanying drawings. In the spring the tree is covered with purplish buds, then greenish flower clusters appear, followed soon by winged seeds. In the summer the graceful branches of pointed, oval, tooth-edged leaves cast a welcome shade; and in the winter we



VASE FORM

know from the swinging, deserted nests that the elm is the favorite tree of the oriole.

The elm grows more rapidly than some other trees—the oak, for example—and often attains a height of seventy-five to 125 feet. Individual specimens known to be 200 years old are yet alive. The tough, hard, light-brown wood, so difficult to split, is valued for the manufacture of boats, barrels, wagon wheels and farm implements, and also for fuel. The outer bark of

some species is used in dyeing and sugar refining. One species, the *slippery elm,* a small tree with rough, hairy foliage, furnishes a gluey inner bark which boys like to chew, and which is used in medicine, especially in cases of sore throat. The inner bark of the *white elm* furnishes a strong fiber for cordage and cloth making. The *cork,* or *rock, elm,* with its corky bark, is the species of elm from which were made the hubs of the "wonderful one-hoss shay," made famous in Oliver Wendell Holmes's *The Deacon's Masterpiece.*

In the New England states elms are numerous and beautiful in both country and cities. There, in Cambridge, Mass., stands the "Washington Elm," under which General Washington took command of the Continental army in 1775 (see REVOLUTIONARY WAR, for illustration). A beautiful white elm in Lancaster, Mass., is "the pride of the state." New Haven, Conn., is often called the "City of Elms."

Elm-Leaf Beetle. In 1837, the pest of European elms, the elm-leaf beetle, appeared in the United States and Canada and has since spread throughout America. It is a yellowish-brown beetle about a quarter of an inch long, with three indistinct stripes on the wings. The grub of this beetle is like a caterpillar, first black, gradually changing to yellow, with three dark stripes. The United States Department of Agriculture advises that a week or two after the grubs come out of the pupa stage and feed on the elm's new foliage, the tree should be sprayed with Paris green. M.S.

ELMI'RA, N. Y., the county seat of Chemung County, in the south-central part of the state, 147 miles southeast of Buffalo and 274 miles northwest of New York City. It is situated along both banks of the Chemung River and is on the Delaware, Lackawanna & Western; the Erie; the Lehigh Valley, and the Pennsylvania railroads. The Tioga division of the Erie Railroad, a line forty-six miles long, extends to the Pennsylvania coal fields. Interurban lines connect the city with neighboring towns and with the picturesque state park, Watkins Glen. The population in 1910 was 37,176; by a Federal estimate of 1916 it was 38,120.

Elmira covers an area of seven square miles, in a wide and fertile valley. Its parks include Eldridge, Rorick's Glen, Riverside, Brand, Diven, Grove, Maple Avenue and Wisner. The city has a Federal building, county courthouse, state armory, a state Memorial Library, Arnot Art Gallery, Arnot-Ogden Memorial Hospital, the Elmira Orphans' Home and the Home for the Aged.

The city is the seat of Elmira College (the first college for women in the United States), the Elmira Free Academy and the New York State Reformatory. The latter, a state prison for first offenders between the ages of sixteen and thirty, was the first institution of its kind to be opened in the United States, and has been a model for similar institutions in various parts of the world.

Elmira is an important railway center and has extensive railroad repair shops. Among more than 350 industrial establishments are steel plate works, rolling mills, fire-engine construction works, glass works, boot and shoe manufactories, boiler and engine shops, lumber and planing mills, iron and steel bridge works, factories for tobacco products, also silk mills, knitting mills and hardwood finishing works.

In 1779 the Battle of Newton was fought near the site of Elmira between American and Tory and Indian forces. After the War of Independence there were a few settlers here. A permanent settlement was made in 1788, and in 1815 it was incorporated as the village of Newton. In 1828 it was reincorporated as Elmira and became a city in 1864.

EL PASO, *el pah'so,* TEX., the county seat of El Paso County, is the only large city along 2,000 miles of Mexican border, and the largest city within a radius of 600 miles. It occupies the extreme western point of the state, 645 miles west and south of Dallas, 830 miles south and west of Denver and 815 miles east and south of Los Angeles. El Paso, on the American bank of the Rio Grande, and the interesting old Mexican town, Ciudad Juárez, are joined by a famous international bridge and an electric line.

The first railroad, the Southern Pacific, was built to the city from the west in 1881. It is now entered by the Atchison, Topeka & Santa Fe; the Texas & Pacific; the Mexican Central; the Mexico North Western; the El Paso & Southwestern; the Chicago, Rock Island & Gulf; and the Galveston, Harrisburg & San Antonio roads. Overland automobile routes pass through the city. During the thirty years from 1880 to 1910, El Paso grew from a settlement of a few adobe houses with a population of 736, to a modern city of 39,271 inhabitants. In 1916 there were 63,705 inhabitants, of whom nearly fifty per cent were Mexican.

Near El Paso is the lowest pass between the

extreme ends of the Continental Divide, hence its name. Since its founding the city has been the natural gateway between the United States and Mexico. It is situated at an altitude of 3,710 feet, on a broad plain sloping up to the hills northeast and northwest. Because of its high and dry climate it is a favorite health resort. In adjacent mountains are rich mines and large areas of exceedingly valuable pine timber. The Elephant Butte Dam on the Rio Grande in New Mexico, a few miles from El Paso, is the largest irrigation reservoir in the world, constructed at a cost of $10,000,000. This is one of several government projects which will reclaim hundreds of thousands of acres in the once arid valleys of this vast section.

El Paso is a city of fine public buildings and private residences, many of them constructed of reinforced concrete. Prominent structures are many fine banks, hotels, business blocks, churches and schools, a Carnegie Library, a Y. M. C. A., a Masonic Temple and club buildings, a courthouse and a city hall. A new Federal building to cost $700,000 was begun in 1916. The city contains the Texas State School of Mines, a summer normal school and business colleges. Fort Bliss, a regimental cavalry post, is three miles east. Through the city passes a large irrigation canal whose banks are beautified by landscape gardening. The fifteen parks contain nearly 150 acres, and are valued at $2,300,000. Cloudcroft, at an elevation of 10,000 feet, is a splendid natural park and resort in the neighboring mountains.

The total imports (consisting chiefly of cotton, cattle, silver, zinc, copper and lumber) which passed through the port of El Paso in 1915 had an appraised value of $9,149,410. Exports during the same year (consisting mainly of coal, shoes and cotton goods) were valued at $6,146,650. Metal mining is the greatest industry of this great section, and the pay roll of the El Paso smelting companies (copper, lead, silver and gold) is $1,000,000 annually. Among the most important manufactures are highly-finished white-pine products; smelter, foundry and shop products; cement, flour, brick, cigars, food products and household furnishings. El Paso is the market for the great cattle and agricultural interests of the surrounding country.

One of the finest office buildings stands upon what was once a part of the Ponce de Leon Ranch. The first settlement was made after the Mexican War and the town was chartered as a city in 1873. In 1910 the commission form of government was adopted, providing for a mayor and four councilmen. The waterworks system, costing $1,500,000, the supply being obtained from artesian wells, is owned by the city. During the border disturbances of 1916 several conferences between Mexican and United States generals were held in El Paso (See MEXICO, subtitle *History*). M.W.

CONTRASTS IN EL PASO

At the left, the American business center; at the right, the appearance of the Mexican section.

EL'WOOD, IND., a city in Madison County, centrally located in the state, fifty miles north and east of Indianapolis and 160 miles southeast of Chicago. It is on Duck Creek and on the Lake Erie & Western and the Pittsburgh, Cincinnati, Chicago & Saint Louis railroads. The population in 1910 was 11,028. The area of the city is about three square miles. Elwood has large manufactories of tin plate, shovels, kitchen cabinets, lamp chimneys and lawn mowers, and there are tomato-catsup and other canning factories. It has considerable trade in grain, live stock and produce. The principal public buildings are a Federal building, erected at a cost of $80,000, and a Carnegie Library.

ELYRIA, *e lir'i a,* OHIO, the county seat of Lorain County, in the north-central part of the state, seven miles south of Lake Erie and twenty-five miles southwest of Cleveland. It has an area of seven square miles and a favorable location at the junction of the East and West branches of the Black River. Both streams here descend forty feet and furnish

power for manufacture. Elyria is served by the Baltimore & Ohio and the New York Central railroads and by electric interurban lines. The population, which in 1910 was 14,825, was 18,618 in 1916.

Elyria was founded about 1819, was made the county seat in 1823 and became a city in 1892. It has a splendid natural park, a public library and a hospital. Large quantities of building stone and grindstones are produced from the Berea quarries in the vicinity. The city manufactures automobiles, telephones, home-lighting plants, canned goods, concrete blocks and moldings, paints, metal polish, switchboards, machine parts and iron pipe.

ELYSIUM, *e lizh' i um,* or **ELYSIAN,** *e lizh' an,* **FIELDS,** in classical mythology, the home of the good and blessed after death. When a soul left this world it was tried before three judges of Pluto, the god of the dead. If the good outweighed the evil, the soul was sent to this beautiful region, which had sun, moon and stars of its own and where all were happy and joyful. Early writers, such as Homer, considered the Isles of the Blessed as Elysium, while in later times it was thought to be a section of the lower world. Many poets refer to it as the land of pleasure and delight, as in Shakespeare's *King Henry VI,* Part III:

> How sweet a thing it is to wear a crown,
> Within whose circuit is Elysium
> And all that poets feign of bliss and joy.

EMANCIPA'TION PROCLAMA'TION, a famous proclamation issued by President Lincoln on January 1, 1863, which declared free all the slaves in the sections then fighting against the United States in the War of Secession. At the outbreak of the war great pressure was brought to bear upon President Lincoln to free the slaves in the seceded states. The early success of the Confederate forces drove him to the conviction that if the war were made a war against slavery as well as for the preservation of the Union, it would stimulate the Federal forces and possibly prevent foreign recognition of the Confederacy as an independent government. He waited only for some victory in the field to furnish a good opportunity to take the step. Early in September, 1862, Lee, at the head of 60,000 troops, entered Maryland in his first invasion of the North, and on September 17, after a terrible day's fight at Antietam, he retreated across the Potomac. Lincoln took this opportunity to issue, five days later, a preliminary proclamation of warning. In this he stated that if the seceded states did not lay down their arms and return to the Union within one hundred days, namely, on January 1, 1863, he would declare all of their slaves "forever free."

Accordingly, on New Year's Day he issued the final proclamation. The President believed it to be a necessary war measure, justified by circumstances. Slavery, however, was not legally abolished by this proclamation; this was effected by the thirteenth amendment to the Constitution, passed by Congress in 1865. See SLAVERY.

EMBALMING, *em bahm' ing,* the art of preparing bodies for burial, chiefly by the use of gums and chemicals, in order to preserve them temporarily from decay and to prevent infection. Three thousand years ago embalming was in such a state of perfection in Egypt that bodies were permanently preserved, but the wonderful secret was lost, and the world has not yet rediscovered it.

The development of modern methods dates from the beginning of the eighteenth century, when Dr. Frederick Ruysch used alcohol to preserve the internal organs and injected an embalming fluid into the arteries. His secret of the preservation of color and form died with him, but soon afterwards Dr. William Hunter, a celebrated anatomist, injected oils into the arteries and embalmed bodies so well that they are still preserved in the Royal College of Surgeons, London. A German preservative, which renders the dead body resistant to decay for years, while it retains its color, form and flexibility, consists of alum, sodium chloride, potash, arsenic and boiling water with glycerine and methyl alcohol. This liquid is used for saturation and injection. At the time of the American War of Secession, Dr. Thomas Holmes gave a great impetus to embalming in America by preparing many bodies of dead soldiers to be sent home.

After the blood is removed, about four quarts of embalming fluid are injected into the blood vessels and cavities of the body. The chief ingredient of this fluid is formaldehyde, but mercuric chloride, arsenic, zinc chloride and alcohol are also used.

Ancient Embalming. This art, which existed as far back as 4000 B. C., was carried to great perfection among the Egyptians, who embalmed not only human beings, but also cats, crocodiles and other sacred animals. These bodies, called *mummies,* have been found in all the ancient tombs of Egypt; for instance, in 1880 the mummy of King Mer-en-re was

found at Saqqara in his pyramid, perfectly preserved after forty-five centuries. The Egyptians used three processes, according to Herodotus, the ancient historian. The first, which was very complicated, was the most expensive and was used only by the very wealthy people. The second, a cheaper method, consisted in injecting cedar oil into the abdomen and steeping the body for seventy days in a solution of caustic soda. The contents of the abdomen were then allowed to escape and the body was ready for burial. The cheapest method, which was employed by the poor, was simply to place the body in natron for seventy days, after rinsing the abdomen with a compound called syrmaea.

Kings and members of the royal family had beautiful tombs, such as the great Pyramids at Gizeh. In 1871 an Arab discovered a large tomb at Der El-Bahari filled with coffins heaped one on another Many royal persons were found to be in the collection, among them Rameses II, whose features were again shown to the world after 3,200 years. E.C.

EMBAR'GO. In international law an embargo is an order forbidding ships in a port to put to sea A government may establish an embargo to gain possession of the ships of an enemy or to shut off supplies from a country with which it has a disagreement but is not at war. The first form, the *hostile* embargo, is no longer practiced; instead, The Hague agreement is observed which requires that ships in an enemy port at the outbreak of hostilities shall be given time to depart. The other form, the *civil* embargo, is still permissible, though uncommon

Outside of international law the word has come to mean a nation's prohibition of the export of a particular commodity. Thus, at the outbreak of the War of the Nations in 1914 England placed an embargo upon wool, and in 1916 there was an effort made to establish an American embargo upon foodstuffs, to reduce prices by keeping agricultural products in the country. Congress refused to consider the question.

Embargo Act. On December 22, 1807, in Jefferson's administration, the United States, exasperated by the repeated aggressions of Great Britain and France, forbade its ships to carry goods to foreign countries. It was thought that the offending powers would suffer if deprived of American commodites, but instead, the suffering was at home. New England, the center of foreign trade, was most severely affected and discontent there became so widespread that Congress repealed the embargo in February, 1809. It was succeeded by the Non-Intercourse Act (which see).

EMBEZZLEMENT, *em bez''l ment,* the dishonest appropriation of property by a servant, clerk or agent through his position of trust. Embezzlement is distinguished from larceny by the fact that in the former case the property is already in the hands of the thief as a trust and he appropriates it to his own uses. The offense is a crime in all states and provinces, and is punishable by imprisonment, usually for a term not less than five years.

EMBOSSING, *em baws'ing,* the art of producing raised figures upon plain surfaces, such as leather, paper, wood or metal. It was the earliest form of metallic ornamentation, and is usually employed for delicate or costly works, although a cheaper method has been adopted by forcing thin sheets of metal into dies. When a raised pattern is produced by blows or pressure upon sheet-metal, leather, cloth, paper, gutta-percha, etc., it is said to be *embossed.* Embossing of metal may be done by hand by beating up the metal from the under side, which method is called bossing, or *repoussé.* Writing paper and cards are embossed with two dies—a steel die and a counter-die, the latter being formed of millboard or leather, faced with gutta-percha. The paper or card is dampened, and a lever-press is generally used to fix the impression.

There is a method of embossing wood by saturating it with water, in which state a red-hot cast-iron mold is pressed heavily upon it. By a recently invented American process, veneers of wood are embossed with metal dies. In needlework, embossing is done by embroidering over figures padded with cotton or other material.

EMBROID'ERY, an artistic form of needlework, the fashioning of ornamental designs on cloth or other materials. The possibilities of embroidery have been known and appreciated from the earliest historic times, and it is to-day one of the most popular of the domestic arts. Something of its scope is expressed in the following lines from a poem by John Taylor, an obscure English writer of the seventeenth century:

Flowers, plants and fishes, birds, beasts, flies and bees,
Hills, dales, plains, pastures, skies, seas, rivers, trees,
There's nothing near at hand, or farthest sought,
But with the needle may be shaped and wrought.

The tools of the embroiderer consist chiefly of scissors, needles and a frame or hoop to hold the material. Small pieces of work do not usually require a frame. Various kinds of thread are used, including cotton and linen, silk, wools and twist. The different stitches, with their variations, are almost beyond number, familiar forms being the outline, the embroidery buttonhole, the cross, the satin, the feather, the herringbone, the chain, the crewel and the tent stitches. Directions for using these and other stitches are given in numerous instruction books, most of which are well known. There are also a number of good monthly publications devoted exclusively to needlework. Various stitches which are popular at any one time may be superseded shortly by new ones devised by the ingenuity of woman.

A great variety of articles in every-day use testify to the skill, care and patience required of the embroiderer. Handkerchiefs, dresses, underwear, towels, table linen, sofa pillows, sideboard and dresser scarfs, bed furnishings, doilies and curtains are representative of the many familiar articles that are beautified by this art.

Embroidery work has been found on mummy clothes in Egyptian tombs, 5,000 years old, and the art is known to have been practiced by the ancient Greeks and Romans. It was introduced into Europe from Byzantium (Constantinople), reaching a marvelous degree of perfection in the Middle Ages. One of the most celebrated examples of European embroidery is the Bayeux Tapestry (which see), a band of linen over 230 feet long and nineteen inches wide, embroidered in colored wools with seventy-two pictures representing scenes connected with the Norman Conquest of England in A. D. 1066.

Oriental embroidery has the same characteristics it possessed a thousand years ago. That of the Chinese and Japanese is very elaborate, most of the work being done upon silk, with the figures in brilliant colors of silk alone or combined with gold and silver. Besides silk and gold threads, beads, spangles, pearls and gems are used by the Persians, Turks and Hindus in their embroideries. In Central Africa, the girls of certain tribes decorate skins with embroidered figures of flowers and animals. The reindeer-skin garment of the Laplander is adorned with figures worked with a needle made of reindeer bone and with thread made of reindeer sinews. S.L.A.

Consult Christie's *Fancy Work for Pleasure and Profit* and her *Embroidery and Tapestry Weaving.*

EMBRYO, *em'bri o,* **AND EMBRYOLOGY,** *em bri ol'o ji.* In a general sense the word *embryo* refers to the beginning of anything, while it is still in an undeveloped condition. Specifically it refers to the beginning of life—the young plant within the seed, the chick within the egg, the unborn animal.

Embryology is the scientific study of the development of the embryo. It commences with the development of a germ cell, which may be a part of the body of another individual, a bud, or an egg, to the completed plant, animal or human being. Such study gives clues to heredity and so to the study of the development of a family of plants or animals or of a race of people. See CELL.

EM'ERALD, a well-known pure green precious stone, which when flawless commands a price almost equal to that of the diamond. It is a variety of beryl (which see), and is the softest of precious stones, though somewhat harder than quartz. Its natural form is either rounded or that of a short, six-sided prism. Emeralds of large size, free from flaws, are rare. The finest are now obtained from Colombia, but some excellent specimens have been found in North Carolina. One of the largest on record was the size of an ostrich egg and was worshipped by the inhabitants of the valley of Manta, in Peru, as the *mother of emeralds.* One specimen weighing over six pounds is now in the Royal Museum at Petrograd. In the book of *Revelation* the emerald is mentioned as forming the fourth foundation of the city of Jerusalem.

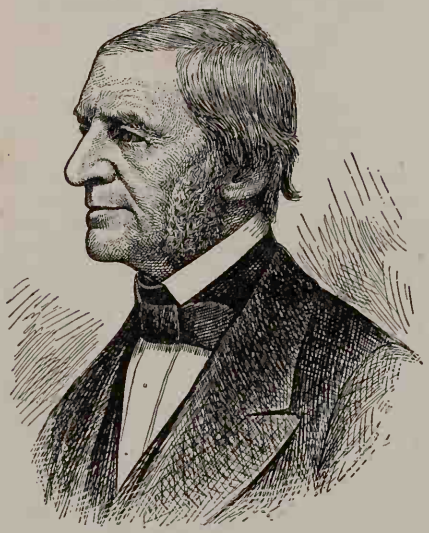
The emerald is the birthstone of May and signifies, in the so-called language of precious gems, success in love.

EMERALD ISLE, *ile,* a poetic and familiar name for Ireland, referring to its velvety-green vegetation. The name is said to have been first used by Dr. William Drennan in his poem *Erin,* a stanza of which follows:

Arm of Erin, prove strong, but be gentle as brave,
And, uplifted to strike, still be ready to save;
Nor one feeling of vengeance presume to defile
The cause or the men of the Emerald Isle.

EM'ERSON, RALPH WALDO (1803-1882), an American philosopher, essayist and poet, whose writings have never ceased to be an inspiration to noble ideals and right conduct. The keynote of his philosophy is self-reliance and individual

freedom, both in the intellectual and the religious life, and this ideal, which he consistently held up to the youth of his country throughout



RALPH WALDO EMERSON

"He was loved and reverenced as few men have been; his reputation shed lustre upon his country, and the stimulus he imparted to pure living and high thinking was extraordinary."

his career, found perfect expression in his own life and character. In the closing lines of his inspiring essay on "Self Reliance" may be found the summary of his creed:

> In the Will work and acquire, and thou hast chained the wheel of Chance, and shalt sit hereafter out of fear from her rotations. A political victory, a rise of rents, the recovery of your sick, or the return of your absent friend, or some other favorable event, raises your spirits, and you think good days are preparing for you. Do not believe it. Nothing can bring you peace but yourself. Nothing can bring you peace but the triumph of your principles.

Ralph Waldo Emerson was born at Boston, on May 25, 1803. His father, a scholarly and cultured minister of the Unitarian faith, was one of a long line of Emersons who had adopted the ministry as a calling. Ralph entered Harvard College when he was fourteen years old, graduating four years later, and after leaving college he taught school and studied theology. In 1826 he was ordained a Unitarian minister, soon becoming pastor of one of the leading churches of that denomination in New England, the Second Church of Boston. Though he was deeply spiritual, his independent spirit chafed at some of the Church forms, and in 1832 he bade his people farewell and retired from the ministry. Thereafter his life work was that of a lecturer and writer.

In 1833 Emerson made the first of several visits to Europe. There he met Landor, Coleridge, Wordsworth and Carlyle, and with the latter formed a lifelong friendship. In 1835 he married and removed to Concord, which was to be his home for the rest of his life, and where he had as neighbors the Alcotts, Hawthorne and Thoreau; the same year he began a course of lectures in Boston on literary and philosophical subjects. These were continued until 1837, the year in which he delivered at Harvard College his famous oration on *The American Scholar,* called by Oliver Wendell Holmes the "intellectual declaration of independence for America." Meantime, in 1836, he had published his first book, *Nature,* which sets forth more completely than any of his other works his doctrine of individual freedom.

The first series of his *Essays,* which appeared in 1841, contains some of his best-known discourses, such as "Self-Reliance," "Compensation" and "The Over-Soul." In 1844 a second series was published. By this time he had become identified with that group of New England idealists who are known as Transcendentalists (see TRANSCENDENTALISM), and for a brief period he edited their official journal, *The Dial.* In 1847, the year in which his first volume of poems was published, he visited Europe again, and during his sojourn in England delivered a course of lectures, some of which may be found in his *Representative Men* (1850). This journey also inspired *English Traits* (1856), a brilliant book of travel. Other notable prose writings include *Conduct of Life*

EMERSON'S HOME

"The house in Concord . . . . was the goal of pilgrims from all civilized nations."

and *Society and Solitude.* He was continually before the public as a writer and lecturer until about 1870, when his health began to fail. His last years were spent quietly at Concord,

and he lies buried in beautiful Sleepy Hollow Cemetery, near the resting place of Nathaniel Hawthorne.

It is their nobility of thought more than their intellectual quality that has given Emerson's writings their enduring and far-reaching influence. His poems, like his essays, are reflective and serious, and though they have never become so popular as Longfellow's or Whittier's, among them are found some of the best in American literature. Representatives of these are *Each and All, The Rhodora, Threnody, Terminus* and his stirring *Concord Hymn,* sung at the completion of the Battle Monument, April 19, 1836. The first stanza of this poem is famous:

By the rude bridge that arched the flood,
Their flag to April's breeze unfurled,
Here once the embattled farmers stood,
And fired the shot heard round the world.

The Rhodora, his most charming nature poem, contains the often quoted lines:

Rhodora! if the sages ask thee why
This charm is wasted on the earth and sky,
Tell them, dear, that if eyes were made for seeing,
Then Beauty is its own excuse for being.

Emerson's lofty ideals and unfailing courage, which remained with him until the end of life, found perfect expression in the closing lines of *Terminus:*

As the bird trims her to the gale,
I trim myself to the storm of time,
I man the rudder, reef the sail,
Obey the voice at eve obeyed at prime:
"Lowly faithful, banish fear,
Right onward drive unharmed;
The port, well worth the cruise, is near,
And every wave is charmed."

The following books will be found helpful to those wishing to study more thoroughly the life and writings of the great essayist: *Correspondence of Emerson and Carlyle,* edited by C. E. Norton; Cabot's *A Memoir of Ralph Waldo Emerson;* Cooke's *Emerson: His Life, Writings and Philosophy;* Howell's *Literary Friends and Acquaintances;* Eliot's *Emerson as Seer;* Stedman's *The Poets of America.*

EMERY, *em'er i,* the stone used in making emery paper, emery cloth and emery wheels. It is blackish or bluish-gray in color, and is found in masses which look like boulders. Emery is an impure corundum (which see), is composed chiefly of alumina and quartz, is of coarse, granular structure, will not melt, and is not acted on by acids. It has been used for centuries for polishing gems and other stones, and in more recent times has had a wider use in polishing metals, in finishing wood and in sharpening tools. The finest grades are used for polishing gems and lenses.

The rock is ground to various grades of fineness, each being suited to some special purpose. The ground emery is then placed on cloth, paper or wheels. Emery cloth and paper are made by coating the fabric with glue and sifting the emery on it. Emery wheels are made by mixing the proper proportion of emery in the cement of which the wheel is made. The cement must be thoroughly mixed and of the right degree of hardness to wear away with the emery, or the surface will soon become uneven. The best emery comes from the island of Naxos, in the Mediterranean Sea, though it is quarried to some extent in the United States and Canada.

EM'IGRATION AND IM'MIGRATION. These terms relate to the same process, the transfer of residence from one section or country to another, as seen from different viewpoints. The European who leaves his native country with the intention of making his home in Australia, Canada or the United States, is an *emigrant,* literally, *one who goes away.* On the other hand, Australia, Canada or the United States regards him as an *immigrant,* that is, *one who comes in.* From the earliest ages of which any record exists men have changed their place of residence from time to time. Ancient tribes and races migrated in a body, sometimes thousands of miles. The migration of a tribe, however, is different from emigration. Modern emigration is a movement of individuals, not of tribes or nations; men may emigrate in groups of tens or thousands, but in every case the initiative comes from the individual, who desires to change his home.

Causes of Emigration. The causes of emigration are as varied as human nature; to sum them up in a word or a phrase is impossible. Many emigrants leave their homes from love of adventure, to seek their fortunes in a new land. The gold-seeker may wish to become rich in a brief time, but he is also an adventurer. Economic, political or religious oppression at home, or unusual opportunities for freedom urge both men and women to seek refuge in foreign lands. The emigration of the Russian Jews in the nineteenth and twentieth centuries, no less than the emigration of the Pilgrims in the seventeenth century, was due to these causes. Failures of crops, followed by famines such as those of 1845 and 1846 in Ireland, industrial depression following financial panics, and the reaction following political dis-

turbances, such as the revolution of 1848 in Germany, have all had a share in making thousands dissatisfied with their ancestral homes. On the other side, the new countries of the world offer advantages, such as cheap land, higher wages and a higher plane of living, which appeal especially to the poor or to those in moderate circumstances. The flow of immigration has been greatest to four sections of the world—Australia, Argentina, Canada and the United States.

The Relation of Governments to Emigration. In an obvious way emigration is a loss to the country from which it takes place. This loss is not necessarily an evil, for it may prevent overpopulation. Emigration does, however, mean a loss of able-bodied workmen, for nearly all emigrants are males between the ages of fourteen and forty-five. Recognizing the extent of this loss, governments have at various times forbidden their citizens from leaving the country. Since 1876, and more especially since the beginning of the twentieth century, the European governments have sought to protect their would-be emigrants, their health and morals as well as their purses, from unscrupulous agents. In addition, the home governments may furnish accurate information in place of the glowing and often deceptive accounts furnished by agents whose business it is to secure new settlers.

Relation of Governments to Immigration. The attitude of a country towards immigration is determined by a number of factors, but as a rule the younger the country the greater the inducements it offers to immigrants. The development of a new country requires human labor in constantly-increasing amounts, and every immigrant is an economic gain. Up to a certain but variable point all law-abiding, industrious immigrants are welcome, for they are assimilated by the whole population. They submit to the political, social and economic institutions of the land of their adoption, and they and their children become citizens. But when the flood of immigration passes the point of assimilation, when thousands of immigrants are arriving, and remain, for all practical purposes, foreigners in ideals, customs, language and even political allegiance, then the new country faces the problem of regulating immigration. This is the condition which now confronts the United States and, to a much smaller degree, other new countries. A country must also, for its own protection, exclude certain undesirable classes, including paupers, criminals and persons with contagious and certain other diseases.

Immigration to Canada. Canada's population, like that of the United States, is composed almost entirely of immigrants and their descendants. Most of the immigration to Canada has always been from the mother country and the United States. At the last Dominion census, in 1911, there were in Canada 784,500 persons born in the British Isles—almost exactly one-half of the Dominion's foreign-born population. Natives of the United States numbered over 300,000; of Russia, over 100,000; and of Austria-Hungary over 120,000.

The annual statistics of immigration are not quite accurate, for the reason that many of the persons who land at Canadian ports intend to settle in the United States, and many others, intending to settle in Canada, eventually drift across the border. If some allowance is made for these facts, the following table shows the fair annual averages of immigration to Canada, and the effect of the War of the Nations:

1871-1880,	annual average	35,000
1881-1885	" "	110,000
1886-1900	" "	40,000
1901-1905	" "	104,000
1906-1910	" "	186,000
1911-1914	" "	363,000
1915	(year ending March 31)	145,000
1916	" " " "	49,000

Since 1901 Canada has excluded immigrants who are physically, morally and mentally unfit. All immigrants must come to Canada by continuous journey from the country of birth or citizenship, on through tickets purchased either in that country or in Canada. In winter an adult immigrant, except an Asiatic, must have in his or her possession $50 and a ticket to destination; between March 1 and October 31 only $25 and a ticket are required. Relatives and certain other persons going to live with persons already settled in the Dominion are admitted without the money requirement. An Asiatic immigrant must have $200 in money and his ticket.

Immigration into the United States. From its foundation the United States has received more immigrants, and has had a larger proportion of immigrants among its population, than any other country. About one-third of all the people in the United States are of foreign birth or parentage. In the early years of the republic immigration was natural and commonplace, and no attempt was made even to count the immigrants until 1820. No law on the subject appears until 1864, when Congress

first officially encouraged immigration. From year to year there is considerable fluctuation in the number of arrivals, but the following table is a fairly-accurate index of the increase and of the effect of the War of the Nations:

1821-1830,	annual average	14,000
1831-1840	" "	60,000
1841-1850	" "	171,000
1851-1860	" "	260,000
1861-1870	" "	231,000
1871-1880	" "	281,000
1881-1890	" "	525,000
1891-1900	" "	369,000
1901-1910	" "	880,000
1911-1914	" "	1,033,000
1915	(year ending June 30)	327,000
1916	" " " "	299,000

The "Old" and the "New" Immigration. There has been a gradual but marked change in the character of immigration to the United States. The most desirable immigrant is he who will be Americanized in the shortest time. Other things being equal, a Briton is the best, for he speaks the same language, has many of the same ideals and quickly adjusts himself to the new conditions. Germans and Scandinavians, being people of allied race and language, are next desirable, whereas the Chinese and Japanese, being totally alien, are theoretically least desirable. The fact is, as strikingly shown by the table below, that the "older" immigration was composed of the more desirable peoples, while the "new," or more recent arrivals, belong chiefly to nationalities which are not quickly assimilated to the conditions in the United States:

IMMIGRANT FROM	PER CENT OF TOTAL IMMIGRATION							
	1821-1830	1851-1870	1871-1880	1881-1890	1891-1900	1901-1905	1906-1910	1911-1914
United Kingdom	76.5	54.5	43.5	29.9	19.4	10.0	9.3	8.4
Germany	6.8	38.2	34.3	30.7	14.1	4.6	3.2	3.1
Sweden, Denmark and Norway	0.2	1.0	11.2	16.0	9.9	7.6	4.1	3.2
Italy, Poland, Russia and Austria-Hungary	0.3	0.4	8.1	19.4	49.3	66.8	62.5	63.6
All others	16.0	5.9	2.9	4.0	7.3	10.9	20.9	21.7

The Immigration Problem. With occasional exceptions, the proportion of educated and skilled laborers is much less in the "new" than in the "old" immigration. The old immigration, moreover, was usually by families, whereas the new, except among the Hebrews, is to a larger extent by adult males alone. The tendency of the new immigrants is to feel more keenly the difference between them and Americans and to congregate as separate communities in the heart of the great cities. Forty per cent of New York's population is foreign-born, thirty-five per cent of Chicago's, thirty-six per cent of Boston's and over thirty per cent of the population of a dozen other cities with over 100,000 people. The proportion among males of voting age in the great cities is even more striking. In Detroit fifty per cent of the men over twenty-one are foreign-born; in Cleveland the percentage is fifty-three; in Chicago, fifty-four; in New York, fifty-eight; and in Fall River, Mass., nearly sixty-four.

This tremendous increase, with its dangers to the standards of living of American-born workmen, is responsible for the demand, now more frequently heard than ever before, to keep out "undesirable" foreigners. In 1894 and again in 1913, 1915 and 1916, Congress passed bills restricting immigration to those able to read some language, but in each instance the bill was vetoed by the President, and the majority for restriction was not large enough to override him until early in 1917, when Congress passed such a bill over the President's veto. E.A.R.

Consult Fairchild's *Immigration, a World Movement;* Jenks and Lauck's *The Immigration Problem.*

ÉMIGRÉS, *a me gra',* the voluntary exiles from Paris during the French revolution, which began in 1789. After the Bastille (which see) was stormed by the mob on the night of July 14, the royal princes, followed by many of the nobility, left for the border line of France. In the autumn of the same year a larger number fled from the city, and in 1791, when a new constitution was adopted by those who wished to form a republic, France lost all of its aristocracy. Nobles, priests, monks and prelates crossed the frontier into Germany, Austria and Switzerland, and began to collect troops near Coblenz, where they formed a court around the princes.

The Revolutionists in Paris forced the king to notify the governments of Europe that France would look upon any country as an enemy which allowed preparation for war against France to be made in that country. Early in 1792 the German emperor refused to

interfere with the plans of the troops of the *émigrés,* and on the twentieth of April France declared war on Austria. The French army had little discipline, for most of the generals belonged to the nobility who had fled with the *émigrés,* so the Austrians gained an easy victory. When Napoleon became consul in 1799 he allowed all *émigrés* to return, but many did not go back until his downfall. When the Charter of 1814 was adopted, on the restoration of the Bourbons, they were not allowed to regain their estates or former privileges, nor were they ever fully restored.

EM'INENT DOMAIN', the right of the nation or a state or province, or of public service corporations to whom the power has been lawfully given, to condemn private property for public use. The ownership and possession of such property is then appropriated to the announced public use after the owner is paid due compensation, to be ascertained according to law.

When a railroad surveys for a right of way and a property owner refuses to sell his land through which the survey runs, the railroad may appeal to the courts. An appraiser is appointed who names a reasonable price at which the property owner must sell, or a jury determines the price in what are known as *condemnation proceedings.* In like manner city land is taken for public schools, asylums, municipal buildings, etc. This authority of the state to compel the property owner to sell his land for public purposes is known as the *right of eminent domain.*

The constitutional laws of the United States and Canada provide that no person can lose his property by eminent domain except it be taken for public use, by due process of law, and for just compensation. The phrase "public use" has been liberally interpreted by the courts to include not only public improvements carried on by the state, such as the construction of harbors, canals, fortifications, etc., but also semi-private enterprises in which the public has an interest, as railroads, bridges, mills, etc. The most extended application of the right of eminent domain possibly in the world's history was the determination in 1915 to destroy the village of Osborn, Ohio, in order to build a vast reservoir to receive flood waters and prevent a recurrence of the great flood which devastated Eastern Ohio in 1913. The state paid the people of Osborn $1,500,000 for their property and for the expense involved in founding new homes elsewhere. M.R.T.

EMIN PASHA, *a'meen pa'shaw'* (1840-1892), an African explorer and surgeon, who was made pasha, or governor, of the equatorial provinces in the Southern Sudan in 1878 by General Gordon; this position he held for eleven years. He was born of Jewish parents at Oppeln, Prussia, his real name being Edouard Schnitzer. After receiving his degree in medicine at Königsberg, he was appointed surgeon in the Turkish army, where he adopted the name Emin, meaning *faithful one.* In 1876 he entered the Egyptian service, and in 1883 the uprisings of the dervishes under the Mahdi cut off his country from the civilized world, until Stanley reached him in 1888. He could not be persuaded to leave his people, but in the following year they deposed him and he returned to Egypt. A little later he went on an exploring expedition for the German East Africa Company and was assassinated by two Arabs. See Stanley, Henry Morton.

EMMET, *em'et,* Robert (1778-1803), an Irish patriot, born in Dublin. He was a fellow student with Thomas Moore at Trinity College, and afterwards spent some time on the Continent, where he tried to interest Napoleon and Talleyrand in his effort to free Ireland from English rule. Upon his return to Ireland he led an unsuccessful revolt against the English viceroy in Dublin Castle. He escaped, but returned a few days later to visit his sweetheart, Sarah Curran, when he was arrested, tried, condemned and hanged. His speech just before his execution is considered a brilliant example of fiery patriotism. His attachment to Miss Curran inspired Moore's famous poem, *She is Far from the Land Where Her Young Hero Sleeps.*

EM'PEROR, an imperial title, first used by Julius Caesar in 58 B.C., which is to-day given to the supreme ruler of an empire. It originated in the Latin term *imperator,* meaning *general,* by which the military governors of provinces were known. Up to the fifth century the Roman rulers used the title, and in 800 Charlemagne revived it as the name of the sovereign of the Holy Roman Empire. In 1804, just before that empire came to an end, the last ruler, Francis II, declared himself hereditary emperor of Austria. Peter the Great of Russia had assumed the title in 1721, and the king of Prussia was crowned emperor of united Germany in 1871.

EMPIRE, *em'pyre,* a term used to denote a country of vast extent, whose ruler is usually

called *emperor,* but he may be distinguished by another title of similar import, as *sultan,* in case of Turkey. An empire generally consists of a number of small countries united to form one strong federation, as the result of political union, colonization or conquest. A *kingdom* is usually less extensive than an empire, and is under the sovereignty of a king or queen.

EMPIRE DAY, a day specially set apart in Canada and throughout the British Empire—"in the Overseas Dominions, in India, Australia, South Africa and the islands of the sea"—to foster patriotism among school children. The date is May 24.

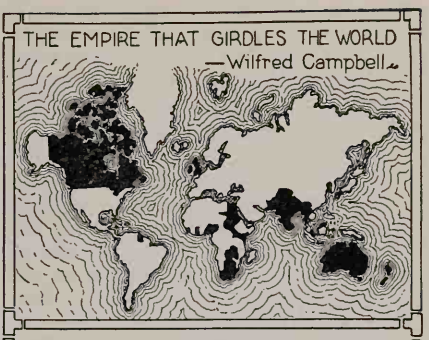
In all schools of the Empire the morning hours are spent in a study of the geography and history of the British Empire and of its greatness. The afternoon is devoted to public addresses, recitations, essays and music of a patriotic nature. Sometimes the celebration is held in the open air with the public participating, and drills, exercises and saluting the flag add to the interest of the occasion.

Empire Day was originated in 1897 by Mrs. Clementina Fessenden of Hamilton, Ont. The *Empire Movement* has since become nation-wide. It has been greatly promoted by Lord Meath, an ardent imperialist.

The motto of the day is "One King, One Flag, One Fleet, One Empire." Its watchwords are "Responsibility, Duty, Sympathy, Self-Sacrifice." Its object is to inspire the children to cherish patriotism, to learn citizenship, to follow duty, to acquire knowledge, to practice discipline, to subdue self, to consider the poor and suffering. Its rallying cry is "For God: For Duty: For Empire." G.H.L.

EMPLOY'ERS' LIABIL'ITY, the liability of employers for injuries sustained by their workmen while actually engaged in their occupations. Under the common law of England and until recently under that of the United States and Canada, the courts have always assumed that an employee, on accepting work, understands and tacitly agrees to accept all the ordinary risks of his occupation, including negligence on the part of his fellow-employees. The employer, on his side, was supposed to be liable for gross negligence and for any special risks which he imposed, but it was seldom that an employee could prove his master even indirectly responsible.

With the introduction of the factory system, the increased use and growing complexity of machinery and the weakening of the



Empire Day

A Suggestive Program

One voice, one people, one in heart,
And soul, and feeling, and desire.
—*Sangster.*

Song, *God Save the King*
Flag Salute
England .....*Wilfred Campbell*
Essay, *What Empire Day Means*
Canada.....*The Duke of Argyll*
Essay, *How the Union Jack Was Formed*
The Union Jack
Essay, *Rise of England as a Sea Power*
The Colours of the Flag.....*F. S. Scott*
Essay, *Jacques Cartier*
Jacques Cartier.....*T. D. M'Gee*
Essay, *The Father of New France*
Canada.....*Charles G. D. Roberts*
Song, *The Maple Leaf Forever*
The Maple.....*H. F. Darnell*
Essay, *The Hudson's Bay Company*
The Voyageur's Song....*J. F. M'Donnell*
Essay, *Wolfe and Montcalm*
Song for Canada.....*Sangster*
Essay, *What Railroads Have Done for Canada*
Canada.....*J. E. Middleton*
Hands All Round.....*Tennyson*
Recessional .....*Kipling*
Song, *Oh Canada*

personal relations between master and workman, there arose a feeling that the common law was too harsh. The first statute intended to extend the employer's liability was an act of the British Parliament in 1880. This law exempted workmen from the common law priciples when injury was caused by defective machinery, and also made the employer liable if the fault lay with the foreman or superintendent to whom the employee was directly responsible. Later laws, in England and other countries, greatly extended the employer's liability. In the United States about twenty of the states passed similar laws and the Federal government by statute recognized its liability towards several large groups of its employees.

The burden of proof, under an employer's liability law, lies with the injured workman. Only a small proportion of injured employees are financially able to force an employer, by law, to make some compensation, and even in many of these cases the amount received is far below the lost earning power. After such liability laws had been in force for some time, employers began to take a new kind of insurance, known as employers' liability insurance, by which the employer is protected against loss; the insurance company agrees to assume the liability if an accident occurs, and to pay the damages. This insurance generally made it more difficult for the workman to collect damages, for the insurance company almost invariably contested the claim.

Workmen's Compensation. The many difficulties which stood between the injured workman and a just compensation gradually led to a new viewpoint, which is indicated by the term *workmen's compensation.* Under the old laws the employer was liable for damages, but under the new plan the injury brings its compensation as a matter of course. Great Britain, Germany, France, Austria-Hungary and nearly all other European nations now have laws providing for compulsory insurance against industrial accidents. Most of the British colonies have acts modeled on that of Great Britain of 1897, which makes the employer liable for injuries in certain hazardous occupations, whether or not he is at fault. A British law of 1906 removes this restriction and makes compensation practically a universal obligation on employers.

In Canada. In the Canadian provinces the subject of workmen's compensation has been handled by the provincial governments. The provincial laws differ widely in principle and in details. The Ontario law, which was followed as a model by Nova Scotia and British Columbia, was framed by Sir William Meredith, was passed by the provincial legislature in May, 1914, and went into effect on January 1, 1915. This law, like others of its type, recognizes that the misfortune of a crippled workman or the needs of his widow or children are not any less because he was at fault or someone else was not at fault, and it provides compensation regardless of the possible negligence on the part of anyone concerned. The law does not apply to all employments, but includes manufacturing, building, lumbering, mining, transportation, navigation and a variety of more or less hazardous occupations. These industries are divided into two classes. In the first, the employer pays an annual assessment to an accident fund out of which workmen are given compensation, but the employer is not individually liable for damages. In the second class, no accident fund is collected, but employers are personally liable for damages. The amount of compensation varies with the degree of injury, but in no case exceeds $2,000 or fifty-five per cent of the workman's average wage.

Of the other provinces of Canada, Manitoba has compulsory insurance in casualty insurance companies, with a provision, however, allowing certain firms to carry their own insurance. The scale and conditions of compensation are almost identical with those in Ontario. The Saskatchewan Act, which has been in force since 1911, limits the compensation to $2,000, regardless of the negligence or responsibility of any person concerned, and the injured workmen may bring suit in a court of law if the employer fails to pay at once. The Saskatchewan law does not apply to agriculture, nor to any work performed on or about a farm.

In the United States. In the states of the Union there is even greater variety of laws on the subject. About thirty of the states have statutes, ranging from a slight extension of the common law liability to compulsory compensation. The more advanced legislation is represented by the laws of Connecticut, Iowa, Minnesota, Nebraska, Oregon and Texas. The compensation laws make payment compulsory in Colorado, Ohio and Washington, and in most other states the injured workman has the option of making a claim under the law. In Nevada, Oregon, Washing-

ton and West Virginia the employer must contribute to a state fund, out of which claims are paid, and in California, Michigan and Ohio there is a state insurance fund in competition with private companies.

The New York law is typical of the most advanced legislation on the subject of compensation. A commission appointed by the governor has charge, and employers must insure in a casualty company, in a mutual organization or in a state fund. At the option of the commission, however, large corporations need not insure if they can furnish satisfactory proof of their ability to pay claims against them. The compensation for total disability is two-thirds of the average weekly wage, and for partial disability two-thirds of the weekly wages are paid for a number of weeks, varying with the character of the injury. W.F.Z.

Consult Barnett's *Accidental Injuries to Workmen;* Labatt's *Master and Servant.*

EMPORIA, *em po'ri a,* KAN., the county seat of Lyon County, in the east-central part of the state, is sixty miles southwest of Topeka, the state capital, and 116 miles southwest of Kansas City. It is on the Neosho and Cottonwood rivers, and on the Atchison, Topeka & Santa Fe and the Missouri, Kansas & Texas railroads. The area of the city is two square miles. In 1910 the population was 9,058; a Federal estimate of 1916 reported 9,622.

Emporia is the seat of a state normal school, the College of Emporia (Presbyterian) and the Emporia School of Music and Art. It has Fremont and Humboldt parks, attractive homes and churches, a fine Federal building, a Carnegie Library and a railroad library, and two hospitals. The city is the commercial center of a rich agricultural region, has a large cattle-shipping business, and has railroad yards, foundries and machine shops, corrugated-metal works and cold-storage plants.

Emporia was settled in 1856 and incorporated in 1870. The commission form of government was adopted in 1910.

EMS, or **BAD,** *baht,* **EMS,** a watering place in Prussia, in the district of Wiesbaden, province of Hesse-Nassau, situated on the Lahn River, ten miles southeast of Coblenz. Ems was known to the Romans as a bathing place, and was celebrated in Germany as early as the fourteenth century. It is noted for its many warm mineral springs, belonging to the class containing soda. These springs are famous for their curative powers, especially in lung diseases. Every year in normal times over 10,000 patients and many tourists visit the city, which has an approximate permanent population of 6,500. Important silver and lead mines are found in the neighborhood. In 1172 the counts of Nassau gained possession of Ems, and in 1866 it was united with Prussia.

E'MU, a large Australian three-toed bird, ranking in size between the ostrich and cassowary. It is distinguished by the absence of a casque, or helmet, and its head and neck are well feathered. The plumage is blackish or

THE EMU

brown, and is very plentiful, there being two plumes to each quill. The wings are concealed in the plumage, and are so small they are useless for flight. The emu digs its nest in the sand, and feeds on fruits, herbs and roots. The feathers have no commercial value, and the flesh is eaten only by the natives.

EMULSION, *e mul'shun,* in medicine, is a term applied to a preparation in which an oily substance is broken up into very fine particles. These are suspended in a liquid in which they are insoluble, or incapable of dissolving, thus producing a milky substance. Emulsifying agents, such as acacia or yolk of egg, envelop the small particles of oil and prevent them from running together. Emulsions are excellent mediums in which to administer medicines having a disagreeable taste, such as cod-liver oil and castor oil.

ENABLING, ACT, the name for any law which authorizes or enables persons or corporations to do things which they were not previously permitted to do. In particular it is an act of the United States Congress preparing the way for the entrance of a new state to the Union by fixing its boundaries

and *enabling* the inhabitants to hold a constitutional convention and draft a constitution to be submitted to Congress for approval. In Canada a province is formed by act of the Dominion Parliament, approved by the King in Council, but this is not usually termed an enabling act.

ENAMEL, *en am'el,* a glasslike glaze of various colors fused to the surface of gold, silver, copper, iron and other substances. Enameling is one of the decorative arts, seen at its best in association with the jewelers', goldsmiths' and coppersmiths' work. Enamel painters have always cherished their art as something apart and independent, and many beautiful things have been done with it, from the jewel-rich panels of Nardon Penicaud, an artist of Limoges, to the finely-finished portraits of Leonard Limousin and the exquisite miniatures by Jean Petitot.

The art of enameling is of great antiquity, for it was practiced by the Assyrians and the Egyptians. Since then all countries have interested themselves in the art. Distinguished with reference to the manner of execution, enamel-work is generally divided into four kinds:

(1) The *Cloisonné,* or inclosed, the method of the Byzantine school, in which the design is formed in a kind of metal case of gold or copper and the colors separated by delicate filigree gold bands;

(2) The *Champlevé,* practiced by the Rhenish and early Limoges schools, in which the figures to be filled in with color are cut in the metal to some depth and the colors separated by a thin partition of the metal to prevent running into each other when fired;

(3) *Translucent enamel,* which had its origin and was brought to great perfection in Italy, composed of transparent enamel of every variety of color laid in thin coatings over the design, which was incised on the metal;

(4) *Surface-painted enamels,* in which the metal plate was covered with a coating of dark enamel for shadows and painted on this with white, the colors being laid on with a hair-pencil and fixed by firing.

The best of the artistic enamel work of the present day comes from the Japanese, but from China and India also come some fine examples. Enamel is also now used for glazing the cheaper varieties of pottery and for coating iron vessels for domestic purposes. A great variety of articles, such as grate-fronts, clock dials, panels of different kinds, bedsteads, name plates, etc., are also executed in enameled iron.

ENCYCLOPEDIA, *en si klo pe'di a,* or **CYCLOPEDIA,** a term which comes from the Greek word meaning *circle,* originally used to denote the group of arts and sciences without study of which no freeman was considered really educated. From this the word came to mean books dealing with these studies, and so in time took on its present significance of a work in which the various branches of learning are treated in separate articles, usually alphabetically arranged. Of such works of reference in the modern sense the ancients knew nothing. A scholar might set down for the use of students all of his information on any subject or on all subjects, but no attempts were made to cover the entire field of human knowledge or to have different portions of such works contributed by specialists. For instance, a Roman named Varro, who died about 25 B.C., produced a work in nine volumes, each of which was devoted to some one subject, and the elder Pliny wrote a famous *Natural History* which purported to give all that was known of the natural sciences. This is the oldest work of an encyclopedic character.

During the Middle Ages several works of a similar kind appeared, but all were arranged topically, and none of them were systematic. The name *Encyclopedia* was first used in 1559, and in the next century appeared the first work in which the subjects were alphabetically presented. This was the *Dictionnaire historique,* published in 1674 by Louis Moréri, which was immediately successful and passed through several editions. Bayle's *Dictionnaire historique et critique,* which appeared in 1697, was the most noteworthy work of that character which had been published up to that time, and attained considerable success in English translations.

In 1704 the first work in English was issued which deserved the name of encyclopedia—the *Lexicon Technicum, or an Universal English Dictionary of Arts and Sciences,* but this was far surpassed by Chambers' *Cyclopedia,* which appeared in 1728. History and biography were omitted, but the cross-reference system was used in this work. A translation of Chambers' work was the first encyclopedia issued in Italian, and, far more important, a French translation was the basis for the famous encyclopedia of Diderot, D'Alembert and their associates. This was more than an encyclopedia, for the authors used it as a means for expressing their own political and religious principles.

In 1771 there appeared a work which has

served as the foundation of the chief encyclopedic work published in England—the three-volume *Encyclopedia Britannica.* In its later editions, to the ninth, emphasis was laid rather on long treatises on important subjects than on brief discussions on the thousands of minor topics found in most encyclopedias; but in the eleventh and latest edition, in twenty-nine volumes, the two plans are combined, so that the *Britannica* in its present form more nearly resembles other encyclopedias. Other works in English which are worthy of note are the *New International Encyclopedia,* in over twenty volumes, and the *Americana,* in sixteen volumes. The chief German encyclopedias are Brockhaus's *Konversations-Lexikon* and Meyer's *Neues Konversations-Lexikon;* while among the chief French works of this kind are the *Encyclopédie des gens du monde,* the *Dictionnaire de la conversation et de la lecture* and *La grande encyclopédie.*

The earlier encyclopedias were chiefly designed for specialists in the various fields, and made no attempt to avoid technical terms and abstruse language. Within the last few decades, however, there has been an increasing tendency to simplify such works so that the general reader may profit by them. Encyclopedias have also been issued which have been intended primarily for children and young people, and which lay stress on all such topics as will help them in their school work. One such work, the *New Practical Reference Library,* which appeared in 1907, had a greater sale than any other work of reference ever issued. Probably no other publication, excepting the Bible, has sold so many copies. The WORLD BOOK is the first which has made its aim the accurate and scholarly discussion of all topics which belong to the province of a thorough work of universal reference in language which children can understand.

ENDICOTT, JOHN (1588?-1665), a fearless and courageous leader of the little Puritan company of sixty persons which settled at Salem, Mass., in 1628, and the man responsible for the establishment of a colonial mint in 1652. His fiery religious zeal led him to leave the home of his birth in Dorchester, England, and join the Puritans in their search for a new home in America. He was governor of his colony for several terms and was a stern ruler. At one time he shipped two of his council back to England for wishing to use the Episcopal prayer book in the public worship, while in 1635 he slashed the red cross out of the English flag because it seemed to him an emblem of the Pope.

ENDIVE, *en'div,* a slightly bitter plant, somewhat like chicory, which is used as a salad, especially when lettuce is out of season. The curled, or narrow-leaved, variety, is most popular, but the broad, straight-leaved endive is also widely used in Europe and America. If grown like lettuce on good garden soil, the only additional care necessary to prepare it for the market is blanching (see ETIOLATION). This is done by lightly tying the outer leaves together. It must not be done, however, when the leaves are damp, for then they will decay.

An illustration appears in a color plate shown with the article VEGETABLES.

ENDYMION, *en dim'i on,* in Greek mythology, a beautiful youth who had asked Zeus (Jupiter) for eternal slumber, and whom, while he was sleeping on Mount Latmos, Diana saw and kissed. The legends regarding him vary greatly, describing him as a king, a hunter and a shepherd. A statue of the sleeping Endymion was found at Hadrian's Villa at Tivoli, and is now in the National Museum at Stockholm, Sweden. The myth was the inspiration of Keats' *Endymion.*

ENEMY, *en'e mi,* a term applied to any state or country at war with another, or to any member of such country's naval or military forces. A private citizen of a hostile nation, according to international law, is not an enemy, and must not be treated as such. However, should that citizen attack, hinder or in any way interfere with hostile troops, he may at once be regarded as an enemy and so treated. All commercial and political relations between enemy states cease on the day a state of war is declared. The treatment to be accorded to combatants of an enemy state is clearly defined by international law and custom. The position of non-combatants is not so definite. Previous to the War of the Nations it was customary to allow citizens of a hostile state residing in another state to continue their peaceful occupations on the principle that only the armed forces were at enmity. During that unparalleled conflict, however, usual precedents were ignored. Germans and Austrians in British or French possessions were made prisoners that they might not be tempted to act as spies or to return home to swell the ranks of the soldiery. Belgian noncombatants were deported by the Germans and in Germany were forced to work for their enemies. See WAR; INTERNATIONAL LAW.

ENERGY, *en'er ji,* the name given in physics to the capacity possessed by matter for doing work. Energy is one of the two fundamental ideas of physics, the other being matter itself. Motion, heat, light, sound and electricity are all energy expressed in different forms. See PHYSICS.

The great source of energy is the sun, and this *solar energy* has been accumulating since the beginning of time. On earth the energy originally derived from the sun which man is able to apply to his own purpose is stored up in coal, wood and oil; in food; in the tides and waterfalls and running streams; in the wind; in the muscular energy of the animal world, and in hundreds of other familiar forms. The process of transferring energy from one body to another is called *work,* and we measure work and energy by the same units.

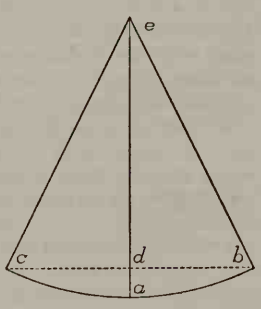
Types of Potential Energy. The two great divisions under which all energy is classified are *potential* and *kinetic,* and whatever is not one is the other. Energy which is slumbering or lying hidden is known as *potential energy,* or *energy of position.* Work has been done upon certain matter—that is, energy has been expended upon it—giving it in turn a power to work which is only awaiting the proper touch to become active. A locomotive under a full head of steam, waiting for the exact moment of departure; a boat held down by its anchor, its sails bulging with wind; a racehorse listening for the starting gun; a baseball in the pitcher's hand; a loaded gun; a boulder balanced on a hillside; a tightly-coiled spring; a hammer poised in air; a bent bow, ready to let fly its arrow, or a stretched elastic band of any kind; an unlighted match; a charged battery; a tank of gasoline, or a lump of coal—all these are examples of potential energy.

Types of Kinetic Energy. *Kinetic* comes from the Greek word meaning *move,* and kinetic energy is therefore the *energy of motion,* or energy which is in actual operation. The moving train; the boat in full sail; the horse speeding toward the tape; the ball or bullet flying through the air; the boulder rolling down to the foot of the hill; the uncoiling spring; the hammer striking the anvil, or the weight falling to earth; the bow or the elastic snapping back to its original shape; the burning match; the battery releasing its electrical charge in the form of a current; the gasoline or coal in combustion, giving life and power to the engine—these are all everyday illustrations of what we call kinetic energy.

The Constant Transformation of Energy. Every change that takes place in the universe results from the change of kinetic energy into potential, or potential into kinetic—a process called the *transformation of energy.* When a boy, for instance, puts a stone in the pocket of a slingshot and stretches the rubber, the stretching process develops kinetic energy transferred from the potential energy in the boy. This kinetic energy, in turn, becomes potential energy in the rubber band, so long as he holds it stretched. When he releases the band the potential energy is transformed into kinetic and is transmitted to the stone. When the stone hits, the energy is transferred to the object struck, once more becomes potential energy, and would reveal itself to our touch in the form of heat.

The Great Law of the Conservation of Energy. By the phrase *conservation of energy* is meant that the amount of energy in the universe is always the same, that it can neither be increased nor diminished. It can be directed, but it cannot be created or destroyed. It is *conserved*—kept. Thus, if energy disappears in one form, another form replaces it *in precisely the same amount.*

The pendulum is an example of the way in which energy changes and is conserved. When we draw the bob aside from *a* to *b,* as shown in the illustration, we are doing work upon it, for we are lifting it in space the distance *ad.* Thus we have stored up potential energy, which begins to change into kinetic the moment we let it drop, is wholly kinetic at *a,* and again wholly potential at *c,* but with the *total energy* always the same. The pendulum has raised itself through an arc (*ac*) equal in length to the arc through which it was lifted (*ab*); that is, it has put forth as much energy as was put into it—no more, no less. The pendulum would continue to swing back and forth forever, exchanging potential energy for kinetic, and vice versa, if it were not for friction and the resistance of the air. However, the energy used up in



MOVEMENT OF THE PENDULUM

Illustrating the transformation of energy.

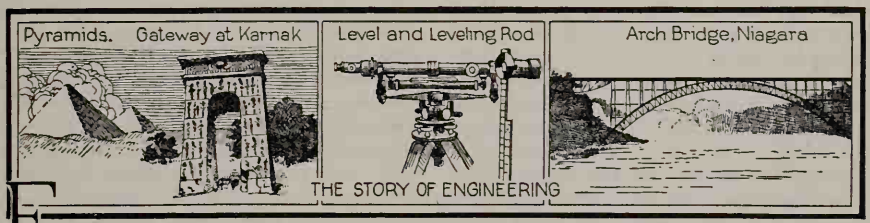
overcoming such friction is not lost; it simply appears in another form. This makes it obvious that for the pendulum to vibrate indefinitely would require a steady manufacture of energy; and since energy cannot be created, the old philosophers' dream of *perpetual motion* is impossible to realize. See PERPETUAL MOTION; PENDULUM. L.M.B.

ENGINE, *en'jin,* a name given to any skilfully constructed mechanism which is capable of converting energy into mechanical work. The name is now mostly applied to the steam engine, in which the force contained in the heat of the steam is transformed into mechanical energy in the form of motion which is then utilized for doing mechanical work. The steam engines, as well as the gas, oil and hot air engines, are known as heat engines, for all of them convert the power of heat into mechanical work. There are other engines from which mechanical work is obtained by utilizing the power of water, and these are known as *hydraulic* engines.

It is well to note the difference between an engine and a machine, however complicated or skilfully constructed the latter may be. An engine produces the motion, while a machine does its work by means of the motion or power which it receives from an engine.

Related Subjects. The reader is referred to the following articles in these volumes:

Energy	Machine
Gas Engines	Physics
Locomotive	Steam Engine



ENGINEERING, a term applied generally to the art or science of construction. A person who practices the art is called an *engineer,* though in former times that name was applied only to those who were engaged in the production of military weapons or defenses. In modern times engineering has become a highly specialized science, which may be roughly divided into *civil* and *military* branches.

The *civil engineer* accomplishes veritable miracles which the average man accepts as a matter of course, merely thankful that someone has devised things for his comfort and convenience. The engineer tunnels half a mile through a mountain and comes out on the other side within six inches of his objective point; he goes a hundred miles into a hilly region, builds great retaining dams and conducts pure, fresh water under ground, over valleys and beneath rivers and gives people in a great city 500,000,000 gallons of water a day; he builds a bridge 400 feet above a raging stream, without a single pier, and over it the traffic of a nation moves; he views a great arid region, discovers miles and miles away a plentiful water supply—maybe amid the eternal snows of the mountain tops—and brings it down to make that desert "blossom as the rose." Wherever civilization penetrates, the civil engineer is almost always an advance messenger to pave the way for home-making and the building of cities.

Military engineers adapt many of the arts of peace to the stern uses of war; they construct fortifications, trenches, bridges, pontoons, telegraph and telephone systems and other devices demanded by military necessity.

Modern engineers usually devote themselves to one branch of engineering; the field is so broad that no man could hope to excel in every branch. Electrical engineering demands special study of subjects of which the mining, irrigation, railroad construction or canal engineer need have no knowledge; each branch requires special preparation and special talent. An engineer who is thoroughly advised in all matters relating to mining might not make a success as engineer for a large irrigation project. Each branch of the art is specialized. This has been called an age of specialization, and nowhere is the truth of that more plainly seen than in engineering.

Among the most remarkable engineering feats of modern times are the construction of the Panama Canal, of the Assuan Dam on the

Nile, and of the reservoir for the supply of water to New York erected in the heart of the Catskill Mountains. In Canada the opening of the Canadian Northern Railroad from ocean to ocean in October, 1915, marked a triumph of engineering skill in railroad construction.

Engineering is one of the most ancient of arts and had been brought to a remarkable state of perfection among Eastern nations centuries before the birth of Christ. One of the greatest engineering feats of all time is seen in the building of the mighty Pyramids of Egypt. So perfectly were they planned and executed that the most delicate of modern engineering instruments and calculations fail to find an error in the theory or practice of their construction, and nobody has ever discovered how the mighty stones were raised to their lofty positions. The Romans left behind them striking monuments to their engineering skill in bridges, aqueducts and roads they built. Ancient Babylon, in its Hanging Gardens, possessed one of the wonders of the world.

Engineering Schools. The need for special education in engineering subjects was first recognized in France and Germany. Schools were established in France in 1747 and in Germany in 1824 for the purpose of training engineers for government service. This example was followed in the United States by the establishment of the West Point Military Academy in 1802; but little else was done in this direction until near the end of the War of Secession. Canada was even later in the field, but so thoroughly has the need of such training been realized that technical schools have been opened in connection with nearly every great university in North America, and many separate technical institutions have been established. The object of these schools is the same in all cases; they aim to give the student a thorough practical and theoretical grasp of that branch of engineering to which he wishes to devote himself. Entrance to the technical schools is gained by examination or by certificate from recognized high schools.

No young man should select any branch of engineering as a profession unless he has an aptitude for higher mathematics. Civil engineering, mining engineering and the like require good physique or ability to endure more or less exposure and hardship. To the boy who has a leaning towards constructive work and who is willing to prepare himself thoroughly, some branch of engineering offers high inducements.

Engineering Instruments. For their varied and delicate tasks engineers have need of many special instruments, some of them very complicated. A description of these is not possible here, nor is it necessary, but a more or less general statement as to the basic instruments in use will be helpful and interesting. The engineer must be able to measure distances accurately, to distinguish directions, to measure angles and to determine at any time whether a certain line or surface is absolutely horizontal, and for each of these processes he makes use of special instruments.

His commonest measuring instrument is the *chain,* made up of links of steel wire. The usual length of this is fifty or 100 feet. As it is subject to a slight variation in length with wear or with alteration in the shape of the links, it is used only for rough measurements.

The instrument used in determining directions is the *compass* (which see); that for measuring angles is the *transit* (which see). This last-named wonderful instrument is the basis of much of the engineer's most important work, and its invention made comparatively easy many computations impossible before. Another very useful instrument is the *level,* which shows with perfect accuracy whether or not a line is horizontal. E.D.F.

Related Subjects. Various phases of the general subject of engineering will appear clearer and more interesting if the reader will consult the following articles in these volumes. Lists of related subjects are also given with some of these articles:

Aqueduct
Assuan
Breakwater
Bridge
Caisson
Canal
Cofferdam
Crane
Dam
Electricity
Engine
Gearing
Hanging Gardens of Babylon
Heliograph
Hydraulics
Hydrostatics
Irrigation
Jetty
Levee
Level
Lighthouse
Lock
Physics
Pier
Pyramids
Reservoir
Steam Engine
Strength of Materials
Surveying
Tunnel
Turbine
Viaduct
Well Boring

The following distinguished engineers are also given separate articles in these volumes:

Armstrong, William G.
Bessemer, Henry
Eads, James Buchanan
Eiffel, Gustave
Ericsson, John
Fulton, Robert
Goethals, George W.
Lesseps, Ferdinand de
Nasmyth, James
Russell, John Scott
Stephenson, George
Stephenson, Robert
Stevenson, Robert

ENGLAND, called by Oliver Goldsmith the "land of scholars and the nurse of arms," is an island kingdom comparatively small in area, but in importance it is among the greatest countries of the world. It occupies the southern portion of the island of Great Britain, and is the chief member of the United Kingdom of Great Britain and Ireland. England's right to this distinction was emphasized by the American, Daniel Webster, in 1834 in these words:

* * * * a power which has dotted the surface of the whole globe with her possessions and military posts, whose morning drum-beat, following the sun, and keeping company with the hours, circles the earth with one continuous and unbroken strain of the martial airs.

Separated by the North Sea, the English Channel and the Strait of Dover from the continent of Europe to the east and south, it has been isolated enough to escape many of the disturbances which have torn the continental countries, but yet close enough to take advantage of every step the latter have made in progress and in government. Its people, moreover, have shown the characteristic island-dwellers' passion for freedom, and there exists nowhere to-day a more liberty-loving people than the English. The old name for England was *Albion,* meaning *white,* given because of the color of its chalk cliffs as seen from the sea.

The People. In every place to which civilization has penetrated, Englishmen are known, for they have never lost that adventurous spirit which led them in the fifteenth, sixteenth and seventeenth centuries to discover, explore and settle upon lands far beyond the seas. Wherever they may be found, Englishmen display many of the same qualities—they are independent, determined, progressive and possessed of decided executive ability and mechanical skill. While not so adaptable as some other peoples—the French, for instance—they have more of a genius for adapting to themselves those with whom they come in contact.

The English are not a pure race, in the sense in which the ancient Greeks were, for example. The history of their country, given below, makes it clear how several peoples, Britons, Angles, Saxons, Jutes and Normans, had a part in the making of the race. Their language, too—one of the most wonderful languages in the world—shows all of the same influences, and more. It is not possible to trace characteristics in detail, to say "From the Saxons came this trait, from the Normans this other," but the mingled strains are there. In another sense the population of England is remarkably pure, for there are comparatively few foreigners.

According to the latest statistics, England is the most densely-populated country in the world, with the exception of little Belgium; it had 34,045,290 inhabitants in 1912. Though the population of the United States has increased at about twice the rate of that of England, it will be many centuries before the former country is as thickly populated as the little island kingdom. In its large proportion of city to country inhabitants England leads the world, over seventy-eight per cent of the people living under city conditions. Just what effect the War of the Nations will have on the population of England, as regards birth-rate and living conditions, cannot for some years be predicted, but it may be said with certainty that it will be profound.

London, the capital of England, is the largest city in the world excepting, possibly, Greater New York, and it is the greatest commercial center. Besides this metropolis there are in England fifteen other cities or boroughs each with a population of more than 200,000. These are Birmingham, Liverpool, Manchester, Sheffield, Leeds, Bristol, West Ham, Bradford, Kingston-upon-Hull, Newcastle-upon-Tyne, Nottingham, Stoke-on-Trent, Salford, Portsmouth and Leicester. There are, in addition, twenty-five cities which have between 100,000 and 200,000 inhabitants each.

Religion. The history of religion in England

has been most interesting; indeed, many of the very important political events, as wars or revolutions, have had their determining cause in some religious questions. Since the days of Elizabeth, Protestantism has been the dominant religion; no Roman Catholic may inherit the throne. The State Church is the Church of England, misnamed Episcopal Church; while correct

Magdalen Tower, Oxford

Salisbury Cathedral

statistics are not available, it is estimated that this established faith has about as many members as all the dissenting Protestant sects together. Of all these dissenting bodies the Methodists are the strongest, as might seem natural in the home country of John Wesley, but the Congregationalists and Baptists also have large followings. Roman Catholicism has had a steady

Canterbury Cathedral

growth in the last half-century, and to-day the number of its adherents is estimated at about 2,000,000. There are almost 200,000 Jews in the country, most of whom are merchants living in the large cities. Indeed, it would be difficult to name a faith which is not represented, for there is permitted perfect freedom of worship, even Mohammedanism having a number of adherents and at least one mosque.

Cathedrals of England. Closely connected with the religious history of the country are the cathedrals—those "investments in religious sentiment" which form the chief ornament of many of the cities and towns. Seldom did the people who began the structure witness its completion: the cathedral at the little town of Ely, for

instance, was begun in 1083 and not finished until 1534. This cathedral, one of the largest in England, is 530 feet in length, has a tower 170 feet in height and the only Gothic dome still in existence. Other of these great architectural triumphs are the cathedrals of Canterbury, Exeter, Lichfield, Salisbury, Saint Paul's, Wells and Lincoln; this last named has a choir which is called "one of the loveliest of human works." Most of these are described in these volumes, either under their own names or in the articles on the cities in which they are located. Various types of architecture were used in the erection of these buildings, and often minor structures, as cloisters or refectories, were grouped about them. Usually the whole group, with an extensive tree-planted open space in front of it, was surrounded by a high wall pierced with gates; some of these enclosing walls still exist.

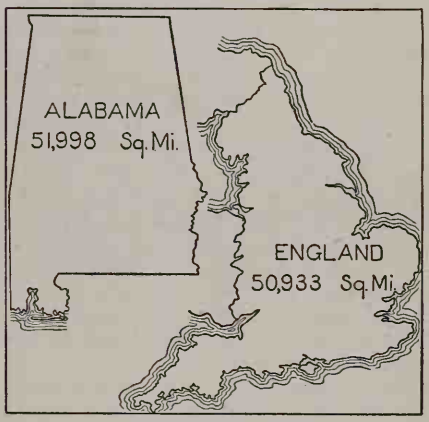
Education. Though England has always been interested in education, and the illiteracy percentage stands at the comparatively low figure of 5.8, it is only in recent years that the educational system has been well organized. Instruction was for a long time too largely in the hands of various religious bodies, or endowed societies, or private individuals, and the government contented itself with bestowing aid upon such schools as could prove their need and their worthiness. What many of the private schools were like, Dickens showed in his description of Dotheboys' Hall, Mr. Creakle's school, Dr. Blimber's select establishment, and others, and there is no doubt that his writings had a large influence in bringing about a different state of affairs. The schools he described might not be typical, but it was inexcusable that any such places should exist, and a movement for the nationalizing of elementary education was speedily set on foot. See DICKENS, CHARLES, subhead *Influence on Education.*

Since 1870 providing elementary instruction has been a duty of the government. Local districts support their own schools, but aid may be obtained from Parliament by poor districts. A national law makes education compulsory between the ages of five and fourteen, but there are certain economic conditions which excuse children from school attendance during the last three years of that period.

Secondary schools also are required by the national laws, but they are not so well organized or managed as are the elementary schools. The great "public" schools, as they are called, such as Eton and Rugby, to which most boys who can afford it are still sent for their secondary education, are not in reality public schools at all, but private schools at which tuition is charged. Secondary education is still largely of the classical type, but there is growing discontent with this. Educational leaders are striving to introduce science, commerce and industry into the schools generally.

At the summit of education in England, though not in any way a part of the national system, stand the great universities. In addition to the two oldest ones, Oxford and Cambridge, there are to-day eight others; these are London University, Durham University, Victoria University of Manchester, Birmingham University, Liverpool University, Leeds University, Sheffield University and Bristol University, the last-named founded no longer ago than 1909.

Interesting Measurements. This great country of England, with a history which all the world looks to as the very basis of constitutional government, with a literature which is second to none, with industries which are world-wide in their importance, is but little larger than the state of New York, for it has an area, exclusive of Wales, of only 50,933 square miles. Its population of 34,045,290, however, is almost four times that of New York state. The greatest breadth of the country, from Land's End on the extreme west to North Foreland on the east, is about 320 miles, while its greatest north-and-south length, from



COMPARATIVE AREAS

The text states that England is slightly larger than the state of New York. The pictorial comparison above emphasizes more strikingly the greatness of this very small country.

Tweedmouth in the northeast to Saint Albans Head on the south, is about 360 miles. In shape the country is roughly triangular, narrowing toward the north, where it is cut off from Scotland by the Solway Firth, the Cheviot Hills and the River Tweed. It is not strange that England should have developed as a sea-power, the real "ruler of the waves," when it is considered that no spot in the island is more than seventy miles from the sea, when the numerous deep indentations and navigable rivers are taken into consideration. England alone, without Scotland or Wales, has a coast line which with all its irregularities measures almost 2,000 miles, and portions of this shore line are famous. Specially notable are the white chalk cliffs at Dover, visible from France, which at this narrowest point of the English Channel is but twenty-one miles distant. Poets have always loved to sing of these steep shores, and Matthew Arnold in one of his best-known poems has written how—

> The cliffs of England stand,
> Glimmering and vast, out in the tranquil bay.

To the west of England are the Irish Sea and Saint George's Channel, beyond which lies Ireland, the other island included in the United Kingdom.

Highlands and Lowlands. Wales is notably mountainous; so is Scotland, but England for the most part is low-lying. The Englishman who has never traveled beyond the borders of his own country can know nothing of towering mountains, snow-clad peaks, or valleys so deep that the sun seldom reaches them. Beautiful rolling downs he may know, picturesque hills, and valleys that slope steeply enough to turn their streams into rushing torrents, but that is all. The highest land in the country is in the north. Here is the so-called Pennine Chain, with its highest point, Cross Fell, 2,930 feet above sea level; and here, to the west of the Pennine Chain, the celebrated Lake District, famous for the exquisite beauty of the clear lakes which lie in its valleys. The greatest altitude in England is reached in Scafell Pike, 3,210 feet, in the Lake Region.

In the southwest there is another range of hills, lower than the northern ones, which runs out into the peninsula of Cornwall and Devonshire, and breaks off abruptly in steep cliffs at Land's End. To the east of this hilly region the southern portion of England is a coastal plain, not so flat as to be monotonous, but broken only by gentle undulations, and in few places reaching an altitude of 500 feet above sea level. It is this southeastern plain region which has made it possible for England to become a great agricultural country.

The history of England might have been very different had it been a land of mountain barriers. The conquerors, whether Roman, Anglo-Saxon or Norman, would have found the conquest of the island much more difficult; that this is true is proved by the fact that

THE CLIFFS OF DOVER

these successive invaders did not continue their inroads into the mountainous regions of Wales and Scotland, where those of the inhabitants who refused to submit had entrenched themselves. The absence of high mountains, too, which would have proved a bar to communication, made it possible for England to develop as one country, not as a series of small, disconnected states, as did Greece.

English Rivers. The rivers of England, in connection with its tides, have had a very real part in its history. They are not long, like the rivers of great continents, but a number of them are navigable through a large part of their course and are thus of great commercial importance. All around the coast the tides are high, that at Bristol reaching the height of thirty feet, and because of this it has been possible for certain cities which are situated some distance from the seaboard to become great seaports. The most famous of such cities is London, on the short Thames, which ranks well to the top among the commerce-carrying rivers of the world. Other eastern rivers of importance are the Ouse, the Humber, the Tyne, the Wear and the Tees; on the west there are the Severn, the longest river of Great Britain, and the Mersey, which carries down to the sea great freights from Liverpool and other manufacturing districts.

Climate. Considering its location, England has a remarkably temperate climate; for while

its latitude is, roughly speaking, that of Labrador, it has little or none of the intense cold of that country. Its mild winters and cool summers it owes to the surrounding seas, and especially to the Atlantic Ocean and the Gulf Stream, from which blow those southwest winds which are warm enough in winter and cool enough in summer to exert an appreciable influence on the climate. Naturally the western coast is most open to these influences, and the

ENGLISH TYPES: VILLAGE AND TOWN

extremes of temperature are less there than in the east.

In January, the coldest month, the average temperature of the whole country is about 40°, and such temperatures as 10° to 40° below zero, which the resident in the interior regions of the United States and Canada knows so well, are unknown. Nowhere are ships prevented by ice from entering harbors. In the hottest month, July, the greatest heat is experienced in London and its vicinity, but even this is not extreme, for its average is but 64°; while the mean temperature for the whole country in that month is 61°. One striking peculiarity of the climate is its dense fogs, which often roll in from the ocean and obscure the sky for days. "London fogs," these are called, but it is not only in London that they prevail, though they are heaviest there because of the city's smoke, which mixes with them. It is an interesting fact that England as a whole averages just about half as many hours of sunshine in a year as does Italy. The fogs are not unpopular with all the people, for it is said that to them in large measure is due the clear complexions and beautiful coloring of English women.

As a whole, England has a plentiful rainfall, and nowhere is irrigation necessary for agriculture. The westerly winds, blowing against the western highlands, carry plenty of moisture, and in certain districts, as in the Lake Region and in Wales, the annual rainfall is over sixty inches. Throughout the west the amount falls in few places below thirty-five inches, but in the east it is hardly anywhere more than thirty inches and in some places less than twenty-five. Generally speaking, October is the wettest month, though this is not true for all parts of the country. Most parts of England have more or less snow, but the heavy snowstorms or blizzards which leave drifts several feet in depth do not occur.

Industries. Industrially, England is one of the most important countries in the world. To appreciate to the full its position in this respect, it is necessary to bear in mind constantly its small size. Despite this, however, it has great natural advantages—valuable minerals which make possible not only extensive mining opera-

tions, but manufactures as well; fertile soil, and bordering waters which teem with fish.

Mining. This should be noticed first, because it is basic. England has no gold, no silver, no diamonds, but much of its wealth depends upon its minerals, for it has in abundance those two essentials, iron and coal. In the neighborhood of one city, Newcastle, coal is so plentiful that the expression "carrying coals to Newcastle" has become proverbial as indicating entirely foolish and unnecessary labor, and in Lancashire and Yorkshire there is another extensive coal region. The total amount mined each year in normal times is somewhat in excess of 190,000,000 tons, more than one-third as much as is produced in the United States. If it is not the largest producer of coal, however, England is the largest exporter, for its product does not have to be carried great distances before it reaches the sea.

The iron, fortunately, occurs not far from the coal, and is thus the more readily available. Only the United States and Germany produce more iron than does England, but so great is the demand for the metal that large quantities of it are imported, chiefly from Spain. Of the other metals, tin, which is produced in considerable quantities in Cornwall and Devon, has a certain historic interest, because of the fact that it drew to the island the very first traders—the Phoenicians, who visited it long before the ancient Romans turned their attention toward it.

Manufactures. These are very closely connected with the mining activities, and depend upon them almost entirely. Manufacturing is England's greatest industry, six times as many people being engaged in manufacturing as in agriculture. Naturally, the great manufacturing centers are near the coal and iron fields, and are thus to be found largely in the north. There are two great branches of the industry—the textile and the metal, and these are clearly localized. Of the textile industries, cotton manufacture is most important, and even the casual reader about England connects that with the city of Manchester, which is the largest center of this industry in the world. There is a very special reason why Manchester is well-fitted to cotton-spinning, for the drawing-out and spinning of cotton is impossible in a dry climate, and Manchester always has much moisture in its air. In Yorkshire, and especially at Bradford and at Leeds, is centered the woolen industry, which is second only to cotton-manufacture in importance.

As the name Manchester suggests cotton manufacture, so do Birmingham and Sheffield suggest the metal industry. All kinds of metal work are produced in the former city, but in the latter the output is largely steel cutlery. Machinery, too, is made in great quantities at Leeds and at Manchester, while in Staffordshire and in Derbyshire much pottery is manufactured from the excellent clay produced in the neighborhood. An enumeration of all the smaller industries, very numerous as they are, is impossible; but even these, without the great ones, constitute, when taken together, an important factor in the manufactures of the world.

While climate, geographical position and mineral wealth may account in large measure for England's manufacturing supremacy, they alone would never have brought it about. It cannot, in fact, be understood without reference to the industry and the mechanical ingenuity of the English people; for it was from Englishmen that those great inventions came which revolutionized the industrial situation throughout the world—the power loom, the steam engine, the locomotive and the Bessemer process of making steel.

Agriculture. Though not primarily an agricultural country, England has the remarkably-large proportion of seventy-six per cent of its land under cultivation, while in some counties the ratio is as high as nine-tenths. The most advanced methods of cultivation are practiced, and this fact, together with the extensive use of fertilizers, keeps this long-cultivated land in a high state of fertility. Of the cereals, wheat, oats and barley are most extensively grown, and it is noteworthy that in some sections the yield of wheat to the acre averages nearly forty bushels. Green crops and root crops for forage; hops, fruit, especially apples and garden vegetables, are largely raised, but with all its fertile soil, its industry and its intensive farming, England is compelled to import large quantities of foodstuffs.

The system of land-tenure is different from that of most countries. The great proportion of the land is in large estates, which are subdivided into small farms and rented to tenant farmers. This might, to an inhabitant of a country where most owners farm their own land, give an impression of transience, but it is the custom for families to remain generation after generation on the same land until a feeling almost of ownership is developed. Every traveler in England tells of the beauty of its

rural scenery—its small, highly cultivated fields, its blossoming hedges, its vine-grown cottages and its beautiful trees. These scattered trees about the farmlands now in large measure take the place of the old luxuriant forests, for land is too valuable to be left heavily wooded.

Stock-Raising. Certain counties have so high a proportion of grazing land that they are popularly known as "grass counties," and there stock-raising is the most important branch of agriculture. Some of the English breeds of cattle, as Durham and Devonshire; of sheep, as Southdown and Cotswold; and of pigs, as Berkshire, are everywhere famous for their excellence. England is a very large importer of butter, largely from Denmark, for most of the milk produced is needed to supply the demands of the cities.

Fisheries. An island kingdom should have extensive fisheries, and England is noted for its fishing industry. Billingsgate, London, is the largest fish market in the world, and Billingsgate fish-wives are credited with a vocabulary all their own, so peculiarly rich in invective that the word *billingsgate* has been adopted throughout the world. Thither are sent the great catches of herring, haddock, cod, plaice and mackerel which are brought back by the fleets of ships that put out from Grimsby, Hull, Yarmouth, Lowestoft and other fishing centers.

Many of the fish are shipped alive, in tanks, and reach the market as fresh as when they left the sea. Literal fleets they are which bring in these fish, the number of vessels of every sort employed being in the neighborhood of 10,000. They do not confine themselves to the shores near home, but find their way northward to the Faroe Islands and Iceland, and southward to the coast of Portugal to bring home this only article of food which England has in sufficient quantities without importing any. At the outbreak of the War of the Nations in 1914 it became apparent that the fishing boats would run grave risks if they followed their customary routes, but because England needed the food-supply the fishermen quite generally ignored the danger and held to their tasks.

Other Information. For the transportation and communication, commerce, government and religion of England, consult the respective subtitles in the article GREAT BRITAIN. English art is discussed under the titles PAINTING and SCULPTURE; for the language and literature see ENGLISH LANGUAGE; ENGLISH LITERATURE, and the lists accompanying the latter topic.

History of England

In the Earliest Days. It is known that many, many centuries before there was any written record, there were people living in England, but they were not people whom the later inhabitants would be glad to claim as ancestors. Judged by the rough weapons and tools which they left, they were but the rudest sort of savages, dwelling in caves and living by hunting and fishing. But at length there came from the continent of Europe a very different race, the *Celts,* or Britons, who conquered the island and made it their home. They knew how to make instruments of bronze, instead of the stone implements of the savages, and how to till the soil; and it was not so very long before they discovered the use of that most valuable of the minerals, iron. They had a strange, weird religion, and their priests, the Druids, wielded a strong influence.

The Coming of the Romans. When in the course of his victories in Gaul Caesar came to the northern coast, he could see across the narrow channel the "white cliffs of Albion," and there was born in him the determination to cross over to the island and punish the people there who had been giving help to the Gauls against the Romans. In 55 B. C., therefore, the first Roman legions landed in Britain, and the recorded history of the country began. See CAESAR, CAIUS JULIUS.

Not until the time of Claudius, however, almost a century later, was there a serious attempt to reduce Britain to the condition of a Roman province, nor was the conquest really finished until the time of Agricola. Even then the whole island had not submitted, the people north of the Firth of Forth and River Clyde in Scotland never having come under the sway of the conquerors.

In some ways the period of Roman rule was of advantage to the southern part of the island, for the semi-barbarous Britons learned from their conquerors certain of the arts of civilization. Great roads, too, were constructed by the Romans, also flourishing towns, and certain little Briton villages were fortified and built up into cities which to the present day retain their importance as centers of population. One of these little villages the Britons called by a name which meant "Fort-on-the-pool"—Llyn-

din; but the Romans could not catch the curious pronunciation and called it *London,* the name which it bears to-day. Christianity also crept into the island, much to the disgust of the Roman conquerors, and martyrs to the new faith became numerous in Britain.

The Romans Withdraw. The Romans had made no effort to win the respect and the trust of the conquered Britons; they ruled by force, and made slaves of most of the natives. Oppressed and downtrodden for centuries, the Britons had lost the strength which once was theirs, and when in A. D. 410 the Roman troops were withdrawn from Britain to guard Italy against barbarian invasions, the Romanized part of the island was at the mercy of all invaders. The Scots and Picts came down from the north and spread such terror that the Britons called upon the Jutes to aid them. These sea-pirates needed no second invitation, but came, with the related Angles and Saxons, and overran the island. Their ravages were to the full as bad as those of the Scots and Picts, whom they drove back, for they slaughtered the Britons by thousands and reduced most of those who remained to slavery. Only by escaping into the mountain fastnesses of Wales did any of the Britons preserve their lives and their liberty. Strongest of these invading hordes were the Angles, and it was from them that the island finally got its name of *Angle-land,* or England.

These invaders were pagans, and it was for his battles against them that the famous Ar-

thur, the Christian king, lives in legend to this day. In 597 Pope Gregory, who had been attracted to some Anglo-Saxon slaves exposed in the market place in Rome and had vowed to carry Christianity to the land from which such beautiful youths came, sent Saint Augustine to Britain, and the religion which had centuries before gained a hold in the island but had been entirely rooted out, spread rapidly.

Beginnings of a Real Kingdom. The Angles and Saxons gradually divided the territory which they had conquered into seven small kingdoms, commonly known as the Heptarchy (which see). There came a time, near the beginning of the ninth century, when Egbert, king of Wessex, succeeded in making himself lord over all the seven kingdoms, and from 827 dates the foundation of the kingdom of England. There has been a kingdom of England now for almost eleven hundred years, and every king or queen, except six, in all that time has been a direct or indirect descendant of Egbert.

The early kings had no easy task, for they had not only to maintain the dominating power which Egbert had gained for them over the other little kingdoms, but to resist the constant inroads of the Danes, who had gradually gained a foothold on the island. When Alfred, the greatest of these early kings, came to the throne in 871, he found that the Danes had overrun a large portion of the country. Though he could not drive them out he reduced their power, confined them to the eastern part of the island and compelled them to acknowledge him as their overlord. His reign, in more than this one direction, meant much for the country, but his successors were again forced to contend with the Danes, who were constantly issuing from their special territory, the Danelagh. A real advance in government was made during this period, however, especially in the establishment of the Witenagemot, a council of the chief men of the kingdom. Theoretically the king undertook nothing of importance without consulting this body, but in reality a strong king might reign almost absolutely.

STATUE OF ALFRED

England Becomes Danish, then Norman. By 1013 the Danes—not those from the Danelagh, but fresh hordes from the mainland—had made themselves masters of the island, and four Danish kings, Sweyn, Canute, Harold and Hardecanute, ruled in succession. When Hardecanute died in 1042 English and Danes both besought Edward, the descendant of the English royal line, to accept the throne, and he reigned until 1066. This is one of the memorable dates in English history, for in that year Harold, chosen king to succeed Edward, was defeated at the Battle of Hastings by William of Normandy, and the Saxon period of rule in England came to a close. By Christmas William had brought a large part of the island into subjection, and on that day was crowned in London as "king of the English," but not until several years later was the complete subjugation of England accomplished. Gradually, through the centuries that followed, the conquering Normans and the conquered Saxons were assimilated into one people, the English.

Rulers of England. In a brief article it is impossible to give in detail each reign in the history of England. There will be emphasized here only the great movements—those which have had a lasting influence on the country. But every English ruler from the Norman Conquest is treated in these volumes, and a detailed view of English history may be gained from these articles:

Ruler.	Dates of Reign.
William I. the Conqueror.	1066-1087
William II	1087-1100
Henry I	1100-1135
Stephen	1135-1154
Henry II	1154-1189
Richard I	1189-1199
John	1199-1216
Henry III	1216-1272
Edward I	1272-1307
Edward II	1307-1327
Edward III	1327-1377
Richard II	1377-1399
Henry IV	1399-1413
Henry V	1413-1422
Henry VI	1422-1461
Edward IV	1461-1483
Edward V	1483-1483
Richard III	1483-1485
Henry VII	1485-1509
Henry VIII	1509-1547
Edward VI	1547-1553
Mary	1553-1558
Elizabeth	1558-1603
James I (Stuart)	1603-1625
Charles I	1625-1649
(Commonwealth)	1649-1660
Charles II	1660-1685
James II	1685-1688
William III	1689-1702
Anne	1702-1714

During the reign of Anne, in 1707, the two countries of England and Scotland were united constitutionally, and the title of the sovereign became officially not *King of England* but *King of Great Britain and Ireland.* The remaining rulers of this list, therefore, bear that longer title:

George I	1714-1727
George II	1727-1760
George III	1760-1820
George IV	1820-1830
William IV	1830-1837
Victoria	1837-1901
Edward VII	1901-1910
George V	1910-

Medieval England. Of that great system of society, feudalism, so characteristic of the Middle Ages, England had had more than a touch before the coming of William the Conqueror, but it was he who organized society systematically upon that basis; and throughout the centuries which followed the nobles in their controversies with the king were constantly striving to rid themselves of the obligations which feudalism forced upon them. The kings, on the other hand, made constant efforts to strengthen the power of the crown at the expense of the nobility. Much was gained by Henry I, the second ruler after the Conqueror, but during the war for the throne which followed his death the nobles and the clergy made themselves practically independent of the royal authority. See Feudal System.

But in 1154, with the accession to the throne of Henry II, one of the strongest of English kings, the power of the great barons began to wane. Henry found time to establish a just and orderly government and to force the kings of Ireland and Scotland to acknowledge him as their overlord, despite the fact that he spent less of his time in England than he did in France, for his continental territories were more extensive than his island possessions. An outstanding event of his reign was the contest with the Church which ended tragically for Thomas à Becket (which see). Under Richard I much of the sovereign power was again lost, for Richard was interested only in the Crusades and spent less than a year of his reign in his kingdom. He was only too willing, also, to grant privileges to the barons in return for funds to equip his crusading expeditions. He managed to hold on to most of his possessions in France, but these were almost entirely lost during the reign of his brother, the untrustworthy, tyrannical John. Out of the very weakness of this king, however, came good to the country, for the barons were able in June, 1215, to wrest from him that famous document known as the Magna Charta, that "foundation stone of English liberties," as it is called. Under Henry III this "Great Charter" was confirmed, and a further step in the direction of constitutional liberty was taken by the assembling of the first House of Commons, in 1265.

(*a, a*) Alfred's territory at its greatest extent.

Wars with Scotland and France. These two kings had been compelled in spite of their wishes to grant to the country certain liberties, but Edward I, who came to the throne in 1272, showed himself quite willing to rule in accordance with Magna Charta. His love for law, indeed, won him the title of "The English Justinian," an honorable recognition of the great Roman law-giver. It was during his reign that Wales was united with England and that the title of Prince of Wales was first bestowed on the heir to the throne. In his reign, too, began a fierce struggle with Scotland which raged at intervals for centuries and involved the famous patriots William Wallace and Robert Bruce. Edward I gained certain advantages, but these were all lost by his weak successor, Edward II, who after the disastrous Battle of Bannockburn in 1314 was compelled to acknowledge the independence of Scotland.

Partly because France had aided Scotland in this contest and partly because of certain claims which he held to territory in that

dle of the fifteenth century, a French champion, Joan of Arc, arose and under her leadership France gained back what it had lost and left in the hands of England only Calais (see JOAN OF ARC).

Meanwhile, there had been troubled times in England. Several uprisings had occurred during the reign of Richard II, the most serious of which was that under Wat Tyler (which see); in 1399 Richard was compelled to abdicate, and the Duke of Lancaster became king as Henry IV. Because he had been proclaimed king by Parliament he had a great respect for its authority and deferred to its wishes, and country, Edward III began the Hundred Years' War with France. Brilliant as some of the English victories were, they cost the country dear and laid a financial burden upon it which almost wore the people out. The war had one good effect, however; by uniting the Saxon and the Norman inhabitants against France it helped to develop a strong national feeling. Under Richard II, Henry IV, Henry V and Henry VI, the war dragged on, the English successes continuing until the French king was actually obliged to acknowledge the English king as his heir. But finally, about the mid-

that meant another step in the direction of constitutional liberty.

Wars of the Roses. Henry VI, who came to the throne in 1422, was a feeble ruler, utterly incapable mentally, and other claimants to the throne arose. Out of the opposing claims grew a long factional struggle known as the Wars of the Roses (see ROSES, WARS OF THE), in which Henry VI was several times dethroned, only to be again placed on the throne by the next victory of his adherents. In the end, however, the Duke of York gained the upper hand, and in 1461 was made king as Edward IV, and in 1483 his young son succeeded him as Edward V. Richard III usurped the power almost immediately, but after a very short reign was overthrown on Bosworth Field in 1485, while the Earl of Richmond, who united in himself the claims of the houses of Lancaster and York, was crowned king as Henry VII. The long wars had had a profound effect on the country. Most of the barons, the old questioners of the king's authority, had been killed off in the conflict, and their powers had been taken over by the king. Henry VII was strong enough to make the most of this advantage, and Henry VIII, when he came to the throne in 1509, found himself in possession of great power.

The Religious Struggle. The Tudors, of whom Henry VII was the first, were distinguished for their absolute rule, but though they were despotic they were not unpopular, for they made England glorious in the eyes of the world (see TUDOR). It was during the reign of Henry VIII that the Reformation had its beginnings in England, not because Henry was intensely interested in religion or desired to found a new system, but because the Pope would not grant him a divorce from his wife, Catharine of Aragon. As a result he had himself declared supreme head of the Church in England, and enriched himself by seizing the riches of the monasteries.

Henry's son, Edward VI, carried on the work of the Reformation during his short reign, but under the unfortunate "Bloody Mary," who has been more hated than she really deserves, there was a reaction, and many illustrious Protestants fell victims to her fervor for the Catholic faith. Her work was undone, however, by her great sister, Elizabeth, who had herself proclaimed head of the Church, but kept herself and her government free from religious fanaticism. The long reign of Elizabeth was one of the most glorious in all England's history. In literature, in science, in discovery, the period was noteworthy, while an intense feeling of nationality was developed by the defeat of the Great Armada. It was during her reign that Ireland was reduced to dependence on England.

The Stuarts and the "Divine Right." Elizabeth had never married, and the House of Tudor died with her. Her successor was James VI of Scotland, son of the ill-starred Mary, Queen of Scots, who became king of England as James I. The two countries, though now under one sovereign, were not completely united, however, for over a hundred years. James was a firm believer in the "divine right of kings" (which see), and this doctrine brought him into constant conflict with Parliament and marked the beginning of that struggle which ended so disastrously for Charles I. This reign is a starting-point in the history of America, for during it were founded the Jamestown and Plymouth colonies.

The reign of Charles I was almost entirely taken up with a conflict with Parliament which finally resulted in open war. Forced to assent to the Petition of Right, another of those milestones which mark the Englishman's march toward constitutional liberty, he disregarded it, dismissed Parliament and for eleven years ruled arbitrarily, without assembling another. Then followed the Long Parliament, the Civil War, the execution of the king in 1649 and the gradual emergence of Cromwell as the strongest man in Parliament and in the army. Under the Commonwealth, with Cromwell at its head, the country held a position of respect in the eyes of the world, but Cromwell's son Richard proved a weak successor, and in 1660 the royalists brought about the restoration of Charles II. All the arbitrary powers which their predecessors had fought to keep Charles I from gaining, a complacent Parliament almost thrust into the hands of Charles II, who showed himself willing enough to make use of them. It was one of the reigns upon which no Englishman can look with pride. As concerned its foreign policy, England was little more than a dependency of France, which was the instigator of two wars with Holland which cost England much and gained for it nothing; in character it was licentious, the literature of the period reflecting with painful clearness the immorality of the court and of society; but all of this the people submitted to because of their pleasure that the severities of Cromwell's time were over, and that a king of the royal line was again on the throne.

The brother of Charles II, and his heir, was an acknowledged Catholic, and attempts were made to exclude him from the succession, but in vain. In 1485 James came to the throne, and from the first his favoritism for Catholics was as pronounced as the people had feared it might be. He set aside the Test Act and gave positions of trust and honor to Catholics, and he even went so far as to gather an army with which to carry out his plans. So long as it seemed that his line would die out with him, the people bore with his tyranny and the illegality of his acts, but when a son was born to him in 1688, and it became evident that there might be a Catholic succession, several of the great nobles dispatched an invitation to William of Orange and his wife Mary, the son-in-law and daughter of James, to seize the English throne. They came late in 1688, James fled, and the "bloodless revolution" was accomplished without striking a blow.

The Responsible Ministry. William and Mary were made joint sovereigns, but William was the real ruler. He was never popular, because he was looked upon as a foreigner, but he endured his unpopularity in silence, and gave the country a wise and just government. In its foreign relations England was now opposed to France, which was still under the rule of that old tyrant who had been William's enemy for so many years, Louis XIV, "the Grand Monarch." But the most significant movements of the reign were domestic rather than foreign. The Dissenters, who in the previous reigns had been persecuted, at times bitterly, were allowed freedom of worship, and the idea of a responsible ministry became firmly established. Hitherto, the kings had chosen or dismissed their ministers as they saw fit, but it was now declared that all Cabinet ministers were responsible to Parliament, and could hold office only during such time as the party to which they belonged was in the ascendancy in that body.

When William died in 1702, Anne, the sister of Mary, came to the throne. She was well-intentioned, though rather dull, but her reign was made brilliant by the successes of her great general, Marlborough, in the war against Louis XIV (see SUCCESSION WARS, subhead *War of the Spanish Succession*). In literature, too, her reign was noteworthy, Pope, Swift, Addison and others reflecting such glory upon it that it is commonly known as the Augustan Age. It was while Anne was on the throne, in 1707, that the actual legislative union of Scotland with England, begun a century earlier when one sovereign came to reign over the two countries, was at length accomplished. Scotland sent its members to the English Parliament and save in local affairs ceased to have a separate government.

From that date, the United Kingdom bore the name of Great Britain. The history of England since the union is continued in the article GREAT BRITAIN. E.D.F.

Consult Macaulay's *History of England;* Montgomery's *History of England;* Greene's *History of the English People;* Andrews' *A History of England.*

Related Subjects. The articles in these volumes which deal with some phase of English life or history are numerous. The following classified list will make them easily accessible:

CITIES AND TOWNS

Aldershot
Birmingham
Blackburn
Bolton
Bradford
Brighton
Bristol
Canterbury
Chester
Coventry
Derby
Dover
Exeter
Gloucester
Greenwich
Halifax
Huddersfield
Hull
Kenilworth
Leeds
Leicester
Lincoln
Liverpool
London
Manchester
Middlesbrough
Newcastle-upon-Tyne
Northampton
Norwich
Nottingham
Oldham
Oxford
Plymouth
Portsmouth
Preston
Sheffield
Southampton
Stratford-on-Avon
Sunderland
Yarmouth
York

EDUCATION

Cambridge, University of
Eton College
Oxford University
Rugby School

HISTORY

For later history, see list of *Related Subjects* under GREAT BRITAIN.

Agincourt
Aix-la-Chapelle, Congress of
Aix-la-Chapelle, Treaties of
Anglo-Saxons
Armada
Bannockburn
Barebones Parliament
Boyne, Battle of the
Cavaliers
Commonwealth of England
Crecy
Crusades
Domesday Book
Feudal System
Field of the Cloth of Gold
Flodden Field
Grand Remonstrance
Gunpowder Plot
Hampton Court Conference
Hastings, Battle of
Heptarchy
Hundred Years' War
Lancaster, House of
Long Parliament
Magna Charta
Marston Moor
Naseby, Battle of
Normans
Petition of Right
Picts
Plantagenet
Plymouth Colony
Plymouth Company
Reformation, The
Renaissance

OUTLINE AND QUESTIONS ON ENGLAND

Outline

I. Location and Size

(1) Latitude, about the same as that of Labrador
(2) Longitude
  (a) Meridian of Greenwich
(3) Situation with relation to Continent
  (a) Dividing waters
(4) Actual size
  (a) Greatest length, 360 miles
  (b) Greatest breadth, 320 miles
  (c) Area, 50,933 square miles
(5) Comparative size

II. Physical Features

(1) Coast
  (a) Length
  (b) Character
(2) Surface characteristics
  (a) Absence of mountains
  (b) Highest hills
  (c) The fertile plain region
  (d) Effect of surface features on history
(3) Rivers
  (a) Shortness
  (b) Great commercial importance
(4) Lakes

III. Climate

(1) Comparatively even character
  (a) Reasons for lack of extremes
(2) Abundant rainfall
(3) The characteristic fogs

IV. The People

(1) Characteristics which have made them powerful
(2) Racial strains
(3) Density of population
  (a) Most densely populated country
(4) Rural and urban proportion
(5) Great cities
(6) Religion
  (a) The State Church
  (b) Other denominations
  (c) The great cathedrals
(7) Education
  (a) Recent organization
    1. The influence of Dickens
  (b) Elementary schools
  (c) Secondary schools
  (d) The universities

V. Industries

(1) Manufacturing—the chief industry
  (a) Reasons for preëminence
  (b) Chief centers
  (c) Important products
    1. Textiles
    2. Metal goods
(2) Mining
  (a) Coal
  (b) Iron
  (c) Close relation to manufacturing
(3) Agriculture
  (a) Proportion of land cultivated
  (b) Chief crops
  (c) System of land-tenure
  (d) Stock-raising
(4) Fisheries
  (a) Location
  (b) Catch
  (c) Only foodstuff not imported

VI. History

(1) The beginnings
  (a) Earliest inhabitants
  (b) The Celts
(2) The Roman occupation
  (a) Julius Caesar
  (b) Later generals
  (c) Impress on the country
(3) Invading hordes
  (a) Scots and Picts
  (b) Jutes, Angles and Saxons
(4) Introduction of Christianity
(5) The Heptarchy
(6) The first king of England
(7) Struggle with the Danes
  (a) Alfred the Great
(8) The Norman Conquest
  (a) William the Conqueror
(9) Feudalism
(10) Conflict with the Church
(11) Magna Charta
(12) Hundred Years' War
(13) Conflict with Scotland
(14) Wars of the Roses
(15) The Reformation in England
  (a) Henry VIII
  (b) Edward VI
  (c) Mary
  (d) Elizabeth
    1. Firm establishment of Protestantism
(16) King and Parliament
  (a) The "divine right of kings"
  (b) Civil War
  (c) The Commonwealth
  (d) Restoration
(17) Establishment of responsible government
(18) Union with Scotland

See GREAT BRITAIN

Questions

What are England's great "investments in religious sentiment"? Describe two of them.

What effect has the absence of mountain barriers had on the history of England?

How many countries produce more iron?

What does the expression "He has a *billingsgate vocabulary* mean?

What was the Witenagemot, and what part did it play in the government of the country?

How did the Wars of the Roses affect the royal power?

What men helped to make famous the reign of Queen Anne?

What is the origin of the phrase "carrying coals to Newcastle"?

Why does a country which has so many dairy cows need to import such large quantities of butter?

What does "responsible government" mean, and when was it established in England?

How many cities has England which are larger than Des Moines, Ia.? How many has the United States?

How many peaks as tall as the highest in England would have to be piled on top of each other to equal the loftiest point in Canada?

Why does not the system of land-holding create the effect of transcience?

Who was the original missionary to England? By whom was he sent?

What was the good effect in England of the Hundred Years' War? The evil effect?

When did the birth of a baby boy bring about a revolution?

How many inhabitants would Canada have if it were as densely settled as is England?

What peculiar physical feature gave the island one of its former names?

How can land which has been so long cultivated still yield such large returns?

What does the name *England* mean?

Who was the "English Justinian," and why was he so called?

Name three languages which have strongly affected the English tongue.

How does one of the great universities of England differ from an American university?

Why does not England have as cold winters as that part of North America which is most nearly in its latitude?

Name four great industrial inventions which the world owes to the island kingdom.

What was the "Fort-on-the-pool"? How does it rank among the world's cities to-day?

What is the "foundation stone of English liberties," and why is it so called?

What is meant by the "divine right of kings," and when did it cause a civil war?

What quality have the English which makes up for their lack of adaptability?

What does the name *Sheffield* suggest? How does it rank among the world's cities as to its chief product?

Did the Romans ever conquer the entire island?

What was feudalism? Trace briefly its history in England.

Why was the reign of Elizabeth one of the most illustrious in all history?

How has England's island situation been of benefit to it?

What author, generally thought of as a novelist only, had a profound influence on education in England and elsewhere?

When did a great religious revolution grow out of a king's desire for a divorce?

Restoration	Ryswick, Treaty of
Roses, Wars of the	Self-denying Ordinance
Roundheads	Star Chamber
Rump Parliament	Tudor
Runnimede	Witenagemot
Rye House Plot	York, House of

The biographies of the rulers, soldiers and statesmen of England contain much historical matter. The rulers since the Norman Conquest are listed in the article above; the following lists give the soldiers and statesmen who were prominent during the English period, and under GREAT BRITAIN is given a list of those who have made history during the later period.

Early Rulers

Alfred the Great	Ethelwulf
Arthur	Hardecanute
Athelstan	Harold
Canute	William I, the Conqueror
Egbert	
Ethelred II	

Soldiers and Statesmen

Baltimore, Lord	Monmouth, Duke of
Berkeley, Sir William	Montfort, Simon de
Clarendon, Earl of	More, Sir Thomas
Cromwell, Oliver	Pym, John
Cromwell, Thomas	Raleigh, Sir Walter
Delaware, Lord	Rupert, Prince
Edward, the Black Prince	Sidney, Sir Philip
	Strafford, Earl of
Hampden, John	Tyler, Wat
Monk, George	Wolsey, Cardinal

LEADING PRODUCTS

Apple	Iron
Cattle	Sheep
Coal	Tin
Fish	Wheat
Hog	

RIVERS

Avon	Severn
Humber	Thames
Mersey	Trent

UNCLASSIFIED

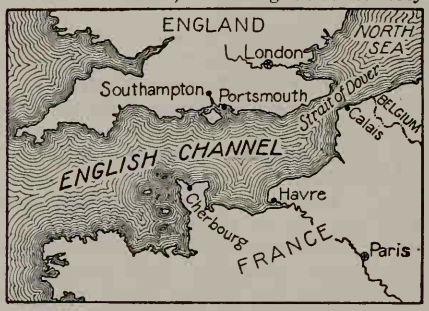
Birkenhead	Spithead
Church of England	Stonehenge
English Language	Tower of London
English Literature	Windermere
Land's End	

ENGLEWOOD, N. J., an attractive residential city in Bergen County, in the northeastern part of the state. It is sixteen miles west of New York City, fifteen miles north of Jersey City and twenty-three miles northeast of Newark, and is served by a branch line of the Erie Railroad. The population in 1910 was 9,924 and in 1916 it was 12,231. The area of the city exceeds five square miles.

Englewood is situated on westward-sloping land, one mile from the Palisades of the Hudson River. The city has fine parks and drives and beautiful residences, two summer homes for working girls, a $200,000 high school, a hospital and a library. There are no important industrial enterprises. Many New York business men make it their home.

In 1871 the township of Englewood was set off from the township of Hackensack, and Englewood was incorporated as a city in 1895. This act of incorporation was declared unconstitutional, and the city was reincorporated in 1899. C.W.U.

ENGLISH CHANNEL, called by the French *La Manche,* meaning *the sleeve,* is an arm of the sea separating France and England. Its length is about 350 miles and its extreme breadth 100 miles, narrowing down to only



twenty miles at Dover. On the English side it extends from the Scilly Isles to Dover; on the French, from Ushant to Calais. It is of comparatively recent formation, as geological time is reckoned, for it is well established that England and France were formerly connected by land. The channel is the greatest commercial highway in the world, with the ports of Falmouth, Plymouth, Southampton, Portsmouth, Brighton and Dover on the English coast, and Cherbourg, Havre, Dieppe, Boulogne and Calais in France. It is also the highway for the vast commerce eastward to the Scandinavian countries and to Germany. It is noted for the roughness of its waters, due to the conflicting currents between the North Sea and the Atlantic Ocean and its frequent wind storms. The Channel Islands, a few miles off the French coast, and the Isle of Wight, are its principal islands.

There have been many schemes devised for building a tunnel underneath the Channel to connect France and England. The proposed route was from a point near Dover to Calais, and nearly one-third of the work was accomplished. Chiefly for military reasons it was vigorously opposed, and in 1883 the British Parliament decided definitely that it was not advisable to open submarine connections with France. Had the tunnel been completed it would undoubtedly have saved lives and money to Great Britain when it became neces-

sary to transport troops to France during the War of the Nations, which began in 1914.

ENGLISH LANGUAGE. The familiar saying that the sun never sets on England's possessions could truthfully be applied to the people who use the language developed in England, for this tongue is spoken throughout the British Empire. It is also the national language of the United States of America. It is estimated that it is spoken by over one hundred fifty millions of the human race. Among the languages of the world, the English is unique in that it is the most composite of them all. From the beginning of its history it has shown a peculiar readiness to take up and make its own many words and forms from other languages, and in none other do foreign terms play so important a part. Dr. Frank H. Vizetelly, in his history of the English language, has expressed this thought in these picturesque words:

> As the land of the Angles developed so the speech of the people grew, and he who wishes to seek that growth must be prepared to traverse the globe. From Scandinavian fiords, he must sail to the shores of Denmark and, journeying over these, must cross the frontier and penetrate the very fastnesses of the German Fatherland. Next his steps must turn to the flowery fields of France whence came the Norman conqueror, and, sauntering along its leafy highways, learn from his surroundings that the noble spires which dot this land, have their very counterpart in the cradle of the English tongue. Even here his journey is far from ended. From the shores of sunny Spain to the lands of the Great White Czar; from the Crescent City on the Golden Horn to the coral strands of India; from the land of the Ibis and the Lotus to the sun-baked veldt of the African Union; from the golden shores of Australia to the fertile fields of New Zealand; from the Land of the Rising Sun to the Land of the Morning Calm; from the Flowery Land of China to the dreary Siberian steppes—from each, from every one has English speech drawn tribute.

This language has been aptly compared to a mighty oak tree, the trunk and bare branches representing the native language forms, which give the tongue its simplicity, directness and force, and the leaves and blossoms representing the foreign element, which gives grace, variety and ornament to the speech. Because of this admirable blending of the native and foreign elements, the English language is unsurpassed in its possibilities for richness, power and variety of expression. No harmony or sweetness or elevation of language is beyond its scope; it has proved a worthy medium for such world-famous writers as Shakespeare and Milton.

History. The English language belongs to the Teutonic branch of the Indo-European family. It is a subdivision of Low German, which in turn is a division of the West Germanic branch of the Teutonic group. It is customary to divide the development of the language into three periods, Anglo-Saxon, or Old English (449-1066), Middle English (1066-1500) and Modern English, from 1500 to the present. The year 449 marked the invasion of Britain (England) by the first of those Teutonic (Low German) tribes who overran the island in the fifth and sixth centuries (see ANGLO-SAXONS). These hardy invaders found in Britain a race of people who spoke a Celtic dialect; the latter, after 150 years of incessant fighting, were driven into Wales and Cornwall. The conquerors' speech, to which the name Anglo-Saxon is usually given, became the language of the country and the foundation upon which modern English is built. The name *Old English,* preferred by modern scholars, is synonymous with Anglo-Saxon.

During the centuries before the Norman Conquest (1066), which closes the early period, many new words were added to the native vocabulary. A few of these were taken from the speech of the Celtic tribes. In the sixth century came Saint Augustine to convert the people to Roman Christianity, and as a result a number of Latin terms and grammatical forms were adopted. *Altar, mass* and *psalm* are among the words of Latin origin introduced at this time. A second important influence was the Danish conquest of the island, through which a considerable Scandinavian element was added to the vocabulary. Four distinct dialects were spoken—Kentish, Mercian, Northumbrian and West Saxon; the Northumbrian was the form used by three of the most important of the early writers, Bede, Caedmon and Cynewulf; West Saxon was the literary medium used by Alfred the Great in his translations, and by the writers of the first history of the English people in their native tongue, the *Anglo-Saxon Chronicle.*

While the Anglo-Saxon vocabulary furnished the bony framework for the Modern English vocabulary, grammatically Old English had many points of difference. There were many more inflections than at the present time, for nouns, pronouns and adjectives had complicated declension systems. Gender, too, was fixed by arbitrary rule and not by meaning, *woman* and *maiden* being neuter, *hand,* feminine, and *foot,* masculine. In general, Anglo-

Saxon grammar was far more complicated than English grammar of to-day. The change has been very gradual.

The Middle English period began with the conquest of England by William, Duke of Normandy, who broke the power of Harold, last of the Saxon kings, at the memorable Battle of Hastings, in 1066. For two centuries after that time French was the language of the upper classes, of the law courts and of the schools, but English lived on the lips of the conquered people, holding its own as the speech of common life and finally becoming the dominant language of the kingdom. About 1250 the two languages began to merge, English absorbing almost the entire body of French words brought in by the Norman conquerors, and becoming thereby more expressive.

Then a Middle English literature began to develop. Three pronounced dialects were spoken, the Northern, Midland and Southern, but the Midland was given outstanding literary prominence because it was used by Geoffrey Chaucer, England's first great poet. Through his genius it became the standard form of the tongue and the parent of the Modern English literary language. During this period great advance was made in the simplifying of grammatical forms, a tendency that is still noticeable.

With the opening of the sixteenth century began the development of Modern English, and since that time the borrowing and assimilation of foreign words have gone on continuously. With the Revival of Learning (see RENAISSANCE) came a considerable body of Latin, Greek and Italian words. Through literary, political and commercial relations with other nations, and as a result of their colonization of lands in every section of the globe, the English people have made wonderful additions to their vocabulary. From the North American Indians they have adopted such words as *moccasin, tomahawk* and *wigwam;* from the West Indies have come *canoe* and *hurricane;* Mexico has contributed *chocolate* and *tomato; canary* and *guinea* are taken from African tribes; Australia has lent *boomerang* and *kangaroo;* China, *tea* and *nankeen;* the Malays, *bamboo* and *gutta-percha;* the Persians, *bazaar* and *caravan,* and so on. Science and invention have also made their contributions to the language; such terms as *hectograph, automobile* and *motorcycle* have come into use as new words, coined to meet new conditions.

The number of words in the English language at the present time is variously estimated by authorities. Dr. Vizetelly, managing editor of the *New Standard Dictionary,* said that in 1917 the total number of words in the English language, including radicals, derivatives, participles, obsoletes and foreign terms, was about 600,000. See SLANG; also DICTIONARY, for suggestions as to word study.

Suggestions for Study. The principles of correct English in writing and in speaking are laid down in the science grammar. Therefore to master the language one must understand the fundamental laws of grammar. The memorizing of a system of rules is not, however, the essence of language study. Many a pupil who can repeat correctly the rule that a verb agrees with its subject in number has used such an expression as *they was* in familiar conversation, and never thought of the rule. Grammar is essentially the science of relationships, and unless the student sees clearly the logical relation that the words of a sentence have to one another his memorizing of rules will avail him little. In the article GRAMMAR in these volumes will be found a comprehensive discussion of this phase of language study and a list of related subjects. All of the important topics connected with grammar, such as case, conjugation, gender, number, etc., are given complete treatment under appropriate headings.

The study of masterpieces of English and American literature is also essential. In the *Autobiography* of Benjamin Franklin we read that this pioneer in American literature gave himself devotedly to the study of Addison's *Spectator* essays, in order to perfect his own style, and Robert Louis Stevenson testifies that he achieved his eminence as a writer by studying the masterpieces and trying to imitate them. Each of the great English and American writers has something to impart to the student, and the study of the classics is therefore of supreme importance. Addison, Goldsmith, Lamb, Irving and Thackeray all wrote with grace, ease and clearness; Ruskin and De Quincey achieved a style which combines the best elements of both prose and poetry; Macaulay should be studied for his striking phrases and his effective use of contrast and balance in the construction of his sentences. These are but a few of a great host of writers whose works are truly a rich storehouse for the student. See ENGLISH LITERATURE; AMERICAN LITERATURE. B.M.W.

THE STORY OF ENGLISH LITERATURE

ENGLISH LITERATURE, one of the world's greatest literatures. In every branch of writing—in the essay, the drama, the novel, in epic and lyric poetry—it has great masterpieces, and one may read from childhood to old age without exhausting its riches. Of the long and interesting history of its development it is possible to give here only a brief sketch, but this is so planned that it will serve as a basis for more extensive reading in these volumes. Each branch of literature is treated under its own title, and the important authors mentioned in this sketch are the subjects of special articles. It is thus possible, by reading the discussion of a certain period here given and the supplementary articles on the writers mentioned, to gain a clear idea of what the period stood for.

Authorities differ in their method of dividing the literary history of England into periods, but the classification here followed is one of the best known.

I. **The Anglo-Saxon Period** (450-1050). There are works in English literature which an Englishman cannot read, for the earliest are written in a language, known as *Anglo-Saxon*, which at first sight is altogether different from Modern English. Literature was not at first *written;* it was *sung* by the minstrels, or gleemen, when they were called upon to encourage those going into battle or to praise the popular heroes. Only gradually arose the custom of writing down such songs, that they might be preserved. Of this early Anglo-Saxon poetry the great monument is the long poem *Beowulf* (which see); it was probably written down about the beginning of the eighth century. This epic really originated in continental Europe; but about the year 670 a poem was composed which was really English in its conception—Caedmon's *Paraphrase,* a metrical version of parts of the Scriptures. This, too, is in Anglo-Saxon, and a person who has not made a study of that can read Caedmon only in a translation. Other writers of note were the Venerable Bede, who wrote an *Ecclesiastical History,* and King Alfred, known as the "Father of English Prose." Foremost among the prose works of this period stands the *Anglo-Saxon Chronicle,* the earliest history produced in their own tongue by any Teutonic people.

II. **The Anglo-Norman Period** (1066-1350). The Norman Conquest of England in 1066 began a new era in literature as well as in history. The chief interest in the works produced for three centuries after this date centers not in the thought but in the gradually changing medium of expression—the language which was slowly shaping itself out of the French, Latin and Anglo-Saxon. Real literary development was slow, but about the year 1200 there was written a poem of genuine imaginative power—the rhyming chronicle of Layamon, known as the *Brut.* Metrical romances in cycles, such rhyming chronicles as the *Brut,* and religious poems were the favorite forms of literature, but new forms were coming into popularity.

III. **The Age of Chaucer** (1350-1400). John Wyclif made his translation of the Bible, which had wide influence; William Langland, or others whose names are not known, produced the remarkable *Vision of Piers Plowman,* that clarion call to justice and common honesty; but still England waited for its first really great writer. Not for long, however, for Chaucer was born about 1340, and despite his busy life produced poems that entitle him to the name "Father of English Poetry." Chaucer's work is treated fully elsewhere; here it is enough to say that with him all hesitancy vanished once for all from English literature, which had entered upon its period of steady development. The stage of preparation or transition was over; the troublesome dialects had crystallized, for literary purposes, into one language, and though it differed in spelling and in many inflections from Modern English, it may be read without great difficulty.

AN OUTLINE ON ENGLISH LITERATURE

An article on each author named appears in its alphabetical place in these volumes.

I. EARLY LITERATURE

Poetry

Beowulf
Caedmon's *Paraphrase*
Vision of Piers Plowman
Geoffrey Chaucer
The Canterbury Tales

Prose

The Venerable Bede
King Alfred
John Wyclif

II. ELIZABETHAN AGE

Poets and Their Chief Works

Non-Dramatic
Edmund Spenser. 1552-1599
Faerie Queene
Dramatic
William Shakespeare. 1564-1616
Hamlet
As You Like It
Ben Jonson. 1573-1637
Every Man in His Humor
Christopher Marlowe. 1564-1593
Tamburlaine

Prose Writers and Their Chief Works

Sir Walter Raleigh. 1552-1618
History of the World
Francis Bacon. 1561-1625
Essays

III. THE PURITAN AGE

Poets

John Milton. 1608-1674
Paradise Lost

Prose Writers

Izaak Walton. 1593-1683
The Compleat Angler
Jeremy Taylor. 1613-1667
Holy Living and Holy Dying
John Milton
Areopagitica

IV. THE AGE OF RESTORATION

Poets

John Dryden. 1631-1700
Alexander's Feast

Prose Writers

John Bunyan. 1628-1688
Pilgrim's Progress
John Locke. 1632-1704
Essay Concerning Human Understanding
Sir Isaac Newton. 1642-1727
Optics

V. AUGUSTAN AGE

Poets

Alexander Pope. 1688-1744
Essay on Man
Edward Young. 1683-1765
Night Thoughts

Prose Writers

Joseph Addison. 1672-1719
Sir Roger de Coverley Papers
Essays
Richard Steele. 1672-1729
Essays
Jonathan Swift. 1667-1745
Gulliver's Travels
Daniel Defoe. 1661-1731
Robinson Crusoe

VI. THE AGE OF JOHNSON

Poets

Thomas Gray. 1716-1771
Elegy Written in a Country Churchyard
Oliver Goldsmith. 1728-1774
The Traveller
She Stoops to Conquer
William Cowper. 1731-1800
The Task
Robert Burns. 1759-1796
Cotter's Saturday Night

Prose Writers

Samuel Richardson. 1689-1761
Clarissa Harlowe
Henry Fielding. 1707-1754
Tom Jones
Samuel Johnson. 1709-1784
Rasselas
David Hume. 1711-1776
History of England
Edward Gibbon. 1737-1794
Decline and Fall of the Roman Empire
Edmund Burke. 1729-1797
On Conciliation with America

VII. THE ROMANTIC AGE

Poets

Walter Scott. 1771-1832
The Lady of the Lake
George Gordon Byron. 1788-1824
Childe Harold's Pilgrimage
John Keats. 1795-1821
Endymion
Eve of St. Agnes

An Outline on English Literature—Continued

William Wordsworth. 1770-1850
Ode on Immortality
Lines on Tintern Abbey
Samuel Taylor Coleridge. 1772-1834
The Ancient Mariner
Kubla Khan
Robert Southey. 1774-1843
Joan of Arc
Percy Bysshe Shelley. 1792-1822
Ode to the West Wind
Ode to a Skylark

Prose Writers

Walter Scott
Ivanhoe
Kenilworth
Charles Lamb. 1775-1834
Essays of Elia

VIII. VICTORIAN AGE

Poets

Alfred Tennyson. 1809-1892
In Memoriam
Idylls of the King
Elizabeth Barrett Browning. 1806-1861
Sonnets from the Portuguese
Robert Browning. 1812-1889
Andrea del Sarto
The Ring and the Book
Thomas Babington Macaulay. 1800-1859
Lays of Ancient Rome
Dante Gabriel Rossetti. 1828-1882
The Blessed Damozel
Algernon Charles Swinburne. 1837-1909
Atalanta in Calydon

Historians

Thomas De Quincey. 1785-1859
History of England
Henry Hallam. 1777-1859
Constitutional History of England
James Anthony Froude. 1818-1894
History of England

Essayists

Thomas De Quincey. 1785-1859
Confessions of An Opium Eater
Thomas Carlyle. 1795-1881
French Revolution
John Ruskin. 1819-1900
Sesame and Lilies

Theologians

John H. Newman. 1801-1890
Lead, Kindly Light
C. H. Spurgeon. 1834-1892
The Saint and His Saviour

Scientists

Sir Charles Lyell. 1797-1875
Elements of Geology
Charles Darwin. 1809-1882
Origin of Species
Descent of Man
Thomas Huxley. 1825-1895
Man's Place in Nature
Herbert Spencer. 1820-1903
First Principles

Novelists

Charles Dickens. 1812-1870
Pickwick Papers
David Copperfield
William Makepeace Thackeray. 1811-1863
Henry Esmond
Vanity Fair
George Eliot. 1819-1880
Silas Marner
Adam Bede

IX. MODERN PERIOD

Poets

Matthew Arnold. 1822-1888
Sohrab and Rustum
Dover Beach
Robert Bridges. 1844-
Prometheus the Firegiver
John M. Synge. 1871-1909
Deirdre of the Sorrows
William Butler Yeats. 1865-
The Wind Among the Reeds
John Masefield. 1875-
The Tragedy of Nan
The Everlasting Mercy

Prose Writers

Charles Kingsley. 1819-1875
Westward Ho
Robert Louis Stevenson. 1850-1894
Dr. Jekyll and Mr. Hyde
Rudyard Kipling. 1865-
The Jungle Book
Kim
Maurice Henry Hewlett. 1861-
The Queen's Quair
Arthur Conan Doyle. 1859-
Micah Clarke
Adventures of Sherlock Holmes
Arnold Bennett. 1867-
The Old Wives' Tale
Clayhanger
James M. Barrie. 1860-
The Little Minister
Sentimental Tommy
George Bernard Shaw. 1856-
Man and Superman
Candida
John Galsworthy. 1867-
Fraternity
Justice

IV. **Elizabethan Age** (1550-1620). Leading up to this period, which sets the high-water mark for the world's poetry, was a period (1400-1550) which produced few really great works, probably because it was one of the most troubled, changing times in all England's history. Malory wrote his *Morte d'Arthur;* More, his *Utopia;* Tyndale translated the New Testament, and unknown poets of Scotland made cycles of ballads, but there are no names which stand out as does that of Shakespeare in the age of Elizabeth. Several steps in advance were taken, however. The Earl of Surrey introduced into one of his translations "a strange meter"—blank verse—which was then used for the first time in England. The development of which it was capable is evident from the fact that Shakespeare and Milton used it for their masterpieces. Also, printing was introduced. That statement deserves all the emphasis which can be placed upon it, for it is difficult now to understand the immense influence which it had on learning and on the production of books.

Under Elizabeth, England took its place as the foremost literary nation in the world. The wonderful discoveries and explorations in America fired men's imaginations; the victory of the English fleet over the Armada roused them to frenzies of patriotism; scientific discoveries changed social conditions, and greater religious security helped to make life freer and richer. Literature felt the impetus of all these forces. Thoughtful essays, brimming with the new sciences of the day; poetry so splendid in its music and its imagery that all later ages have gone to it for inspiration; marvelous dramas never since equaled, were poured out in a flood in those fifty years. The name of Shakespeare so far outshines all others that often the lesser lights are almost lost sight of, but Francis Bacon, Edmund Spenser, or Ben Jonson alone would have been enough to shed luster on any age. Besides these there were Sir Walter Raleigh, Christopher Marlowe, Sir Philip Sidney and others, all noteworthy writers. With its intense love of life and of action, this age expressed itself primarily, but by no means exclusively, in the drama.

V. **The Puritan Age** (1620-1660). Old ideals of government and religion were breaking up, and new ones had not been found to take their place, so this age was restless, unsatisfied, and as a result, gloomy. The thirst for beauty, the romantic ardor which breathed through almost everything written during the Elizabethan Age, are no longer to be found in literature, for the love of beauty is sacrificed to the search for truth. There were numerous minor poets, but they emphasized form rather than feeling, and were artificial and intellectual rather than truly poetic. But there was one poet who would have graced any age or nation—John Milton, with his "voice whose sound was like the sea." In prose, too, Milton was the foremost figure of this period, but he was not able to keep himself free from the argumentative tendency of the times, and his prose work therefore lacks a lasting appeal. Robert Burton's curious *Anatomy of Melancholy,* Browne's *Religio Medici* and Izaak Walton's *Compleat Angler,* all books that will live, date from this period. Thoroughly Puritan in spirit, the voice of the age in prose as Milton was in poetry, was John Bunyan, whose *Pilgrim's Progress* was not published until long after the close of the Puritan Age.

VI. **Period of the Restoration** (1660-1700). Sharp indeed was the break between the Puritan Age, with its gloom, and the Restoration period, with its impatience of all restraint. Gayety was the keynote—gayety carried to the point of frivolity; and Shakespeare's greatest dramas were looked upon as insipid and unrefined. Imitations of French writers were numerous, and as the faults rather than the excellencies of the originals were brought over into English, literature in England was in a bad way. There was cleverness, but it was joined with such low moral ideals that most of the poems and plays of the day are unreadable now. Even Dryden, a true poet, was influenced by the demands of the times and produced a number of plays which reflected the looseness of Restoration court society. The *Hudibras* of Samuel Butler, published in 1663, showed how complete was the reaction against Puritanism.

There was one wholesome tendency—that toward simplicity of form. The earlier ages had indulged in verbal extravagances, and if for a time the Restoration poets overdid the pruning process and were stiff and formal, the trouble righted itself later on and an increased naturalness of manner was the result.

VII. **Eighteenth-Century Period** (1700-1800). This was primarily an age of prose, for the myriad interests which were seeking expression were not romantic and poetic, but practical, and in a sense prosaic. The imaginative, the romantic, was not popular, and satire had full sway. Pope, it is true, wrote poetry which in

his own day was accounted better than that of Shakespeare, but it was cold, formal and artificial, entirely lacking in high poetic inspiration. That the Augustan Age, as the first part of the century is called, was a brilliant one may be seen from the names of its writers. During that period Swift produced his *Gulliver's Travels* and his other matchless satires; Addison and Steele wrote their famous *Spectator* papers; and Defoe won thousands of readers with that earliest of novels, *Robinson Crusoe*. The popular *Spectator* was a pioneer in a movement of great importance which finally resulted in the modern newspaper, while the mention of *Robinson Crusoe* indicates another development—that of the novel (which see).

An outstanding figure during the middle of the century was Samuel Johnson, about whom gathered a group of distinguished men—Burke, Goldsmith, Boswell and others—who bowed to his literary dictatorship.

Side by side with the "classic" tendencies of the authors mentioned above, there was growing up a new spirit of romanticism. Thomson, Gray, Cowper, Blake, and, foremost of all, Burns, revolted against the "common sense" standards and demanded that imagination be allowed its rightful place in poetry. A renewed appreciation of nature was evident, and a far greater affection and sympathy for human beings.

VIII. **The Romantic Age** (1800-1850). This was a carrying out of the principles more or less consciously formulated by these early romanticists (see ROMANTICISM). Poetry rather than prose was the dominant literary form, and Wordsworth, Coleridge, Byron, Shelley and Keats reflected in their matchless verse the demand of the age for freedom from affectation. Alike in that one particular, they differed widely in others, for romanticism allowed the expression of individual genius, unbound by general rules. Poets of lower rank, who would have ornamented an age less splendid in genius, were Scott, Moore and Southey, the first-named being remembered rather for his prose than for his verse, for Scott is the outstanding prose writer of the age, and his novels show the romantic spirit as clearly as does his poetry. Lamb, De Quincey and Jane Austen are perhaps the only other writers of prose whose works still find a wide audience.

IX. **The Victorian Age** (1850-1900). Variety seems at first sight to be the keynote of this period, for almost every branch of literature is represented, and by works of high rank. The progress of science, the inventions that came with increasing frequency, the working out of the doctrine of evolution, the social unrest, all left their mark on the literature, and careful study shows that this was all actuated by a more or less definite moral purpose. The writers were the teachers of the people, not unpleasantly didactic, but speaking out with no uncertain voice and teaching charity and the brotherhood of man. The novels as well as the poetry and the essays show clearly this trait—who can fail to find it in those of Dickens, Thackeray or George Eliot? Primarily, this was an age of prose, the three great writers just mentioned, with Macaulay, Arnold, Carlyle and Ruskin, making up a group unmatched in any other age. But poetry was not neglected, and at least two of the Victorian poets are entitled to first rank—Tennyson and Browning; while of the lesser poets, Rossetti, Elizabeth Barrett Browning and Swinburne produced work of which no age need be ashamed. All in all, it is probable that future generations, looking back to the Victorian Age, will call it one of the greatest in the history of English literature.

X. **More Recent Literature.** To give any general characteristics of the literature of to-day is difficult and unsafe—only with perspective is sound judgment possible. It is a period of restless activity in every field, and poems, dramas, plays, essays, history, criticism and biography pour from the presses in a never-ending stream. Of the prose writers, Kipling, Hewlett, Bennett, Galsworthy, Barrie and Shaw will perhaps best repay study, while among the poets Yeats and Masefield have attracted most favorable attention.

The literature of England is not the only literature written in the English language. Across the sea there have grown two literatures of goodly proportions, one in Canada and the other in the United States. These are treated under the titles AMERICAN LITERATURE and CANADIAN LITERATURE. A.MC C.

Consult Dawson's *Makers of Modern English;* Beers' *From Chaucer to Tennyson;* Mrs. Oliphant's *Literary History of England in the Eighteenth and Nineteenth Centuries.*

ENGRAVING, the art of cutting characters, figures or designs of any kind on a hard surface. The earliest engraving was undoubtedly done for ornamentation or decoration. The rock carvings of primitive cliff-dwellers, the inscriptions of the ancient Egyptians, Greeks

and Romans, were of this character. So, too, the Chinese and the Japanese worked elaborate designs on bronze and copper, and probably every reader of this article has seen silverware engraved in more or less elaborate designs. This latter engraving is done solely for the beauty of the design.

Engraving, however, may also be employed for the sake of reproductions which may be printed from it. If an engraved surface is covered with ink and then laid on a piece of paper, the paper will show an impression of the engraving. Such a reproduction is not itself an engraving, but is a *print*. If the ink is spread lightly over the surface of the engraving the lines which have been cut will appear white in the print; this is called *relief* engraving. On the other hand, if the ink is forced into the lines of the design and the surface of the plate is wiped clean, the design will appear in black or colored lines on a white ground; this is properly called *line* engraving, and is represented in these volumes by thousands of black and white illustrations. Relief engraving is usually done on wood; line engraving is usually on copper or steel. If the lines are eaten or bitten into a plate by means of an acid, the process is *etching*, and if the surface is merely roughened, without actually cutting lines, it is called *mezzotint*. Until the discovery of the various processes of photo-engraving, these were the chief means of reproducing designs of any kind; they are discussed briefly here in the order in which they became important.

Wood Engraving. The earliest engraving for the purpose of printing seems to have been by the Chinese, who, from the most ancient times, carved figures on wood blocks. It seems to have had an independent origin in Europe after the introduction of paper in the twelfth century, but the oldest existing print whose date is certain was printed in 1423. The great master of wood engraving is Albrecht Dürer, whose work has been unsurpassed even to the present time. Other great engravers on wood were Hans Holbein (1497-1543), Lucas Cranach (1472-1553), Thomas Bewick (1753-1828), and Timothy Cole (1852-).

Line Engraving. As the name indicates, the design or pattern is cut in lines, usually on plates of copper or steel. The instrument used for this purpose is the burin, or graver, a short steel bar, with a sharp, triangular point. The burin is held in the palm of the hand and is pushed forward along the plate, in which it cuts a groove. Usually the lines are first drawn lightly on the steel or copper, and then cut by the graver. The artist first makes a narrow, shallow groove and afterwards cuts it again and again until it has the desired width and depth. The peculiar appearance of a line engraving, with the design slightly raised above the rest of the paper, is due to the method of printing. The surface of the plate is wiped clean, ink being left only in the grooves. The paper, usually dampened, is then pressed so tightly against the plate that the edges of the grooves show on the paper. In fine prints every line of the engraving will appear slightly raised.

The earliest line-engravers, men like Dürer, Schongauer and Lucas van Leyden, did original work, but in the seventeenth and eighteenth centuries line-engraving was used chiefly for the reproduction of paintings. A few names—Nanteuil, Edelinck, Eisen, Cochin—stand out as those of great artists, but most line-engravers, down to the present, have copied the work of others. For this reason line-engraving fell into disfavor among creative artists; the development of photo-engraving processes in the nineteenth century practically ended its career. The new mechanical processes are cheaper, quicker and for most purposes equally satisfactory. Only for printing bank notes and a high grade of portraits is line-engraving still in common use.

Etching. Etching, on the contrary, has always been regarded as one of the proper means of artistic expression. It has a less formal technique, is more quickly done and gives wider opportunities for individuality. Rembrandt, the father of etching, and probably the greatest etcher who has ever lived, was also one of the world's greatest painters. The etching process is similar to that of line-engraving, except that the lines are bitten out by an acid.

Mezzotint. This is a special form of engraving on copper or steel. The plate is first reduced to a mass of small, prickly points by means of a rocker. The rocker cuts the metal into ridges, and as it is rocked and turned leaves hundreds of tiny projecting points. These points must be smoothed down or cut away entirely to produce a design. For further details see MEZZOTINT. W.F.Z.

Related Subjects. The reader is referred to the following articles in these volumes:

Dürer, Albrecht	Photo-Engraving
Etching	Rembrandt
Mezzotint	Wood Engraving

ENID, *e'nid,* Okla., the county seat of Garfield County, and a market and trade center for the productive agricultural country in the north-central part of the state. It is fifty-five miles northwest of Guthrie, ninety miles northwest of Oklahoma City, the state capital, and ninety-seven miles south of Wichita, Kan. The city is on the Chicago, Rock Island & Pacific, the Saint Louis & San Francisco and the Atchison, Topeka & Santa Fe railroads. The population in 1910 was 13,799; in 1916 it was 20,307.

Enid is in a rich wheat country, and usually is the market for a crop of 5,000,000 bushels from Garfield County. Next in importance to wheat-raising is the poultry business. The value of poultry and eggs handled each year by five wholesale houses in Enid exceeds $3,000,000. The alfalfa fields of the county yield four or five cuttings a year, providing forage for great numbers of horses, mules, hogs and cattle. Creameries and machine shops, boiler works, tile works and manufactories of corn seeders and binders and steel posts are the important industrial enterprises. Natural gas was discovered in the vicinity in 1907.

The prominent buildings are a Federal building costing $125,000, completed in 1912; the courthouse, erected at a cost of $100,000; a Carnegie Library, an opera house and a $200,000 high school building. Enid contains the Phillips Christian University, Saint Francis Institute (Roman Catholic), a college of fine arts and a business college, and it is the seat of the state institute for the feeble-minded.

Enid was founded and chartered as a city in 1893. The commission form of government was adopted in 1909. Water for both drinking and irrigating is obtained between forty and fifty feet under ground. W.H.S.

ENSIGN, *en'sine,* a name applied to a national flag. It is also the title of officers of the lowest commissioned rank in the United States navy, after graduation from the Naval Academy. Until 1862, when the title was adopted, midshipmen were graduated into the navy as *passed midshipmen.* In the United States navy the pay of an ensign is $1,700 yearly, with an increase of ten per cent after five years' service; the corresponding rank in the army is that of second lieutenant. In the British and United States armies ensigns were formerly entrusted with the colors, or ensigns, of the regiment. So devoted were they to the traditions embodied in the flag that death was preferable to loss of the ensign they guarded. Ensign was the title of the lowest rank of commissioned officers in the British army until 1871, when it was succeeded by that of second lieutenant.

ENSILAGE, *en'si laje,* the name given to the green crops stored in a silo. See Silo and Silage.

ENTOMOLOGY, *en toh mol'o ji,* the branch of zoölogy that treats of insects. The various species of insects greatly exceed in number all other animals taken together, so it is natural that their study requires a special division of zoölogy, under a distinctive name. The science of insects began with Aristotle, who included in a class the true insects, the arachnids and the myriapods. These are distinguished from other classes of insects by the fact that the three divisions of the body—the head, thorax and abdomen—are always distinct from one another. With the publication of Darwin's *Origin of Species* a fresh interest developed in entomology, and in fact in all branches of zoölogy, as it was discovered that insects form a convenient group for the exposition of certain problems of animal evolution. See Arachnida; Myriapoda. L.O.H.

ENVELOPE, *en've lope,* a covering, usually of paper, with gummed edges for sealing, in which a communication may be safely sent through the mail. Many improvements have been made in the machinery employed for making envelopes, until the output of some machines, which are of American invention, is 55,000 a day. With the increased number made, the cost of production has lessened until envelopes may now be purchased, in large quantities, with return address printed, at a cost of about fifty or sixty cents per thousand. Previous to the invention of these machines, which now make envelopes in a continuous operation, only about 3,000 could be made in a day, as they were cut out by chisels and folded and pasted by hand.

Until 1840, before the invention of envelopes, all letters were folded so that a blank portion of the paper was left for the address, and they were then sealed by means of sealing wax. Envelopes are in various sizes, but in proportionate widths and lengths in all standard sizes. For identification the sizes are numbered from 5 to 10. A number 5 envelope is five inches long and three inches wide; a number 6 is six inches long and three and one-eighth inches wide. The usual commercial envelope is called number 6¾; it is nearly seven inches in length.

ENVIRONMENT, *en vi' run ment,* from the French word meaning *to surround,* covers the broadest possible field, for it involves all the outside conditions under whose influence every vital thing lives and moves and has its being. Thus it includes not only the *physical environment* implied by climate, contour (topography), food supply, the laws governing light, darkness, sound and the like, but also the *social environment* implied by race, customs, religion, and the institutions of family and state. Of the two, physical environment has the stronger influence and, indeed, practically determines the social. Plants, animals, men and women—all are affected, and to a great extent molded, by their physical environment. The industries of a community or a country, the physical, mental and moral traits of an individual or a people, even the political destiny of a nation, if traced back far enough, will be found to root in physical environment.

The Element of Climate. Climate is perhaps the most important element in physical environment. Heat and moisture, which constitute climate, largely govern the distribution of life on the earth. Hot countries, for instance, produce a more luxuriant vegetation and are more densely populated by the human family, because here the problems of food, shelter and clothing practically solve themselves. This very ease of living, however, leads to habits of slothfulness and indifference and to the loss of alert mental faculties, because man has little need to exercise them. A representative product of such an environment is the native African or Malaysian.

Extremely cold countries, on the other hand, are thinly populated; people live in small, scattered groups, without political organization; and so much energy is consumed in wresting a mere living from nature, so deadening is the monotony of diet and season, that man has neither leisure nor inclination to develop his higher powers. Such an environment produces the Eskimo—stolid, unambitious, unintellectual. See Eskimo.

Arid regions develop an alert, self-reliant type, like the Sahara Arab or the old-time American Indian of the Great Plains, forced into nomadic or semi-nomadic habits through the need of going in search of food and water for the herds and flocks which represent the instruments of the only "trade" possible in that particular environment. See Nomad Life.

The ideal environment is that of the temperate zones, where conditions of living strike a balance, where there remains a fair amount of leisure for self-development, and where varying seasons and sudden changes in temperature keep both mind and body wholesomely stimulated. It is worthy of note that with few exceptions, the great cities of the world are not far from the 40th degree of north latitude.

Characteristics of the plant and animal life of a region depend, no less than the human, upon the climate environment. The degree of moisture is so important a factor in plant environment that the vegetation on the dry and that on the rainy side of the same mountains are often as different as though belonging to two widely-separated areas. Rainfall is such an essential factor of man's environment that an insufficient rain supply has been the cause of many great migrations, especially in the early stages of history.

Adaptation to Environment. Every living thing must be in harmony with its environment or it cannot continue to exist; and as the forces which move the world are constantly creating new environments, life is continually adjusting itself to changing conditions. This readjustment is what constitutes progress and evolution. *Adaptation* is the name given to the process of becoming fitted to environment; and the phrase, "the survival of the fittest," implies that only those forms of life have survived through the ages which were most perfectly adapted to their environment. In fossils we read the ever-fascinating story of the relation that has existed from earliest times between environment and life. See Evolution; Fossil.

Adaptation, however, is also a matter of present-day history. A plant species will in time adjust itself to a very dry and sandy soil by growing long roots which reach out after moisture. Some plants of the desert have roots fully five times the length of their stalks. The wild rose, to be certain of spreading its species, grows a great number of stamens; the cultivated rose, no longer needing this protective measure, adjusts itself to its new environment and puts into extra petals the life-force that formerly went to make extra stamens. In the development of the dog from the wolf; the horse from the primitive eohippus; the big, juicy apple of cultivated orchards from the tiny wild fruit of the Black Sea, and in countless other similar instances we get chapter after chapter of the story of plant or animal life adapting itself to changing physical environment.

Man and Adaptation. Of all the animals, man has been the most successful in adjusting himself to different physical environments. He can bear the greatest extremes of climate. His ingenuity enables him to live in tropical climates or in the icy polar regions, in desert lands or in parts of the earth where it rains for the greater part of the year. He responds to his environment in his way of living, of clothing himself, of enjoying himself, of sustaining himself through labor. When he runs counter to his environment he usually meets with disaster.

Modification of Environment. Man has discovered that, although environment cannot be made over, he can modify it within limits so as to make life easier, richer, better worth living. The measure of civilization is somewhat a matter of the degree to which man ceases to be entirely the creature of his environment. It is to conquer his environment or adapt it to his needs and desires that he tunnels through mountains, bridges rivers, changes the course of streams, digs irrigation canals and builds railroads, ships, flying machines and great telephone and telegraph systems in order to provide easier intercourse with his fellows. He modifies his climatic environment by the special character of his architecture and by devices for heating or cooling his home. He is even learning, through the work of such men as Luther Burbank, that he can do for plants what he cannot do for himself—*create* new environments to develop new species, effecting in a few years changes that nature takes cycles to accomplish. Cultivation is only another way of expressing changed environment.

Social Environment. As civilization advances, greater emphasis comes to be placed on social environment, particularly in its application to the early education of the child. Burbank has said:

"I have taken the common daisy and trained it and cultivated it by proper selection and environment until it has been increased in size, beauty and productiveness at least four hundredfold. * * * Surround the child with the proper environment to bring out certain qualities and the results must come."

However, the consideration of social environment is more properly the province of sociology, and reference should be made to the articles on that subject and to the discussion under HEREDITY. L.M.B.

EOCENE, *e'o seen,* **PERIOD,** a division of geologic time, immediately following the Cretaceous Period and forming the oldest division of the Cenozoic Era. The name means the *Period of the New Dawn.* In North America the rocks formed during this period extended along the Atlantic coast and the Gulf of Mexico and up the Mississippi Valley north of the Ohio. They are also found in some places in the Rocky Mountains. The rocks are sandstone, limestone, marls and clays. By the end of this period nearly all existing groups of mammals had become clearly defined. See CENOZOIC ERA; CRETACEOUS SYSTEM; GEOLOGY.

EPAMINONDAS, *e pam i non'das,* a general and statesman of Thebes, a master of tactics and of strategy. His influence on military art in Greece was powerful. Realizing the increasing maritime power of Athens, he equipped a fleet of 100 triremes (see GALLEY) and won several cities from the Athenian confederacy. When complications threatened Thebes he mustered a large army and four times successfully invaded the Peloponnesus, or southern peninsula of Greece, at the head of the Thebans. His great achievement in politics was the final overthrow of Sparta's power in the Peloponnesus by a decisive battle on the site of Mantineia. Epaminondas was severely wounded during that combat.

EPHESUS, *ef'e sus,* "the city of the Ephesians," one of the twelve ancient cities of Asia Minor. The location here of the Temple of Diana made Ephesus a sacred place from an early date; one of the most common expressions which have come down the ages is "Great is Diana of the Ephesians." Its situation at the starting point of one of the great trade routes of Asia Minor led to its commercial growth. Saint Paul's labors in Ephesus, lasting three years, indicate its prosperity (*Acts* XVIII-XIX; *I Cor.* XV-XVI). A powerful Christian church was established in the city, and prominent men of the Apostolic age made their headquarters there. The destruction of its great temple by the Goths in A.D. 263 marked the beginning of the decline of Ephesus, and before the days of Tamerlane (see TIMUR) it had almost perished.

EPIC, *ep'ik,* a narrative poem of a very special type. *Paul Revere's Ride, An Incident of the French Camp* and Tennyson's *Revenge* are narrative poems, but they cannot be classed as epics, for, according to a high authority—

The subject of an epic poem must be some one great, complex action. The principal personages must belong to the high places of the world, and must be grand and elevated in their ideas and in their bearing. The measure must be sonorous.

This does not mean that every-day matters cannot be introduced, but that they must be subordinate to the central lofty theme. With conditions so hard to meet, it must be an ambitious poet who attempts an epic. Not all who have made the attempt have been successful, but almost every great language of the world has one outstanding epic; only the Greek has more than one. In Greek there are the *Iliad* and the *Odyssey;* in Latin there is the *Aeneid;* in Italian, Dante's *Divine Comedy;* in German, the *Nibelungenlied;* in Spanish, the *Poem of the Cid;* in French, the *Chanson de Roland;* in English, *Paradise Lost,* and in Finnish, the *Kalevala.*

These epics group themselves naturally into two classes—the national, or folk, epic, and the literary epic. The process whereby an epic of the former class came into existence is most interesting. No poet ever declared, "I shall write a great poem about the national hero;" no one man composed all the ringing verses; but gradually, year by year and perhaps century by century, songs grew up about some favorite hero until there was a great cycle. One singer added new narrative, another polished rough places in the old, and so, with unnumbered authors, the national epic reached its completion. Critics believe that the *Iliad* was so written, and perhaps the *Odyssey;* certainly the *Cid* and *Roland* poems and the *Nibelungenlied* were so composed. But the *Aeneid,* the *Divine Comedy* and *Paradise Lost* are different, for each is the work of one man, and is consciously modeled on the other type of epic.

If the term *epic* be used less rigidly, as it sometimes is, many other poems may be included under it. Thus *Hiawatha* may stand as the American epic, while Pope's *Rape of the Lock* takes rank as a mock epic. C.W.K.

Related Subjects. The reader will find reference to the following articles in these volumes interesting and profitable.

Aeneid	Nibelungenlied
Iliad	Odyssey
Literature	Paradise Lost

EPICTETUS, *ep ik te' tus,* from the Greek, meaning *The Acquired,* was a Stoic philosopher, born at Hierapolis, in Phrygia, Greece. In his youth he was the slave of Nero's freedman Epaphroditus. He afterwards lived and taught at Rome until banished by the Emperor Domitian in A.D. 90. His teachings, which are known only through the notes preserved by his pupil Arrian, more nearly approach the spirit of Christianity than any other ancient philosophy. They include the love of good and hatred of evil, obedience to the dictates of conscience and a perfect trust in a wise and merciful Providence. See Stoicism.

EPICURUS, *ep i ku' rus* (342-270 B.C.), illustrious Greek philosopher and founder of the Epicurean school, was born on the island of Samos. He settled in Athens, and in 307 B.C. established a school of philosophy in a garden which he purchased and laid out for this purpose. Because of this incident, his followers were known as the "philosophers of the garden." He is said to have written extensively, although only three of his letters, a few fragments, and a number of sayings have come down to us. The principal sources of our knowledge of Epicurus are Cicero, Plutarch and Lucretius. He was a successful teacher, and his pupils, who came in great numbers from all parts of Greece, Rome and Asia Minor, were devoted to their master as well as to his doctrines.

Epicureanism, a system of philosophy in vogue the latter part of the fourth century B.C. Although Epicurus, the founder, laid down the doctrine that pleasure is the chief good, the life that he and his friends led was one of greatest temperance and simplicity. In psychology, Epicurus was a materialist, holding that the soul is a bodily substance composed of intangible particles scattered through the whole body. "Business, and cares, and anger, and benevolence," he argues, "are not accordant with happiness, but arise from weakness, and fear, and dependence upon others."

According to Epicurus, the sources and tests of all moral truth are the feelings—pleasure and pain. We delight in one and avoid the other. "When we say that pleasure is the end of life, we do not mean the pleasure of the debauchee, but freedom of the body from pain and the soul from anxiety." The philosopher rested justice on the same basis as temperance. Denying any abstract and eternal right and wrong, he believed injustice to be an evil, because it exposed the individual to discomfort from his fellowmen. The duties of friendship and good fellowship he based upon the same theories of security to the individual.

Believing that the dissolution of the body involves that of the soul, Epicurus argued that the most terrible of all evils, death, is nothing to us, "since when we are, death is not; and when death is, we are not. It is nothing then to the dead or the living; for to the latter it

is not near, and the former are no longer in existence." According to the Epicurean belief, the great evil that afflicts men is fear—fear of gods and fear of death. To get rid of these two fears was the ultimate aim of all Epicurus's theories and nature. R.D.M.

EPIDEMIC, *ep'i dem'ik,* a term derived from two Greek words meaning *among the people,* and applied to diseases which attack many people at the same time or in rapid succession. Malaria, influenza, dysentery, cholera, the plague, diphtheria and typhoid are among the diseases which thus attack a community. Every epidemic has its own particular infectious germ. In the case of malaria the infection is due to an animal parasite, and the disease is spread by mosquitoes which have bitten and sucked the blood of someone already suffering from malaria. The bacteria of cholera, dysentery and the plague are carried by human beings or merchandise from country to country, and wherever these germs find people susceptible to those diseases an epidemic breaks out.

Medical science has in recent years done much to reduce the danger of epidemics. The Panama Canal Zone is a striking example of what may be done to improve the health of a community. There the malaria-bearing mosquito has been stamped out, its breeding places in swamps and pools have been drained, and a region once deadly to white men has been rendered practically free from disease. Smallpox, the most dreaded of all epidemics, has been rendered less harmful by preventive measures; vaccination has almost removed smallpox from the list of epidemics in America and most European countries. Medical science in earlier days devoted itself to fighting disease after it had developed; science now seeks causes and endeavors to remove them.

Perfect drainage and sanitation, paving and cleaning of streets and filtration of drinking water are important preventives. Remarkable results have been recently obtained by inoculation. The science of serum therapy has made great progress, and nowhere has it been more clearly proved than in Serbia in 1914, when practically the whole army was attacked by typhoid. The epidemic was completely stamped out by surgeons under the command of Surgeon-General Gorgas of the United States army, who was loaned for the task. Many thousands were inoculated, and early in 1915 the Serbian army took the field with its men in good health and practically safe from future attacks of typhoid fever. J.H.K.

Related Subjects. In addition to the diseases mentioned above, the reader is referred to the following articles in these volumes:

Bacteria and Bacteriology	Inoculation
Gorgas, William Crawford	Mosquito
	Sanitary Science
	Serum Therapy

EPIGRAM, *ep'i gram,* as most correctly used, is a short poem, generally not more than eight lines in length, which has at the very close a sudden surprising or witty turn. An old Latin author, whose name is unknown, in describing the epigram produced a very clever one:

> The qualities rare in a bee that we meet,
> In an epigram never should fail—
> The body should always be little and sweet,
> And a sting should be left in its tail.

Quite as often, however, the term means any concisely or cleverly expressed thought, whether in prose or verse; and while the "sting in its tail" is not necessary, it is desirable. Martial's reflection on his wife, though far from kindly, is typical:

> Lycoris has buried all the female friends she had; would she were the friend of my wife!

The Greeks, who invented the epigram, made of it a thing very different from its modern descendant. With them it was a simple and beautiful verse on a tomb or statue, and the word has the same literal meaning as *epitaph.* It was the great Roman satirists, Catullus and Martial, and especially the latter, who made the epigram the sharp, stinging thing it is to-day, and Martial's epigrams have remained the model for all times. Among the English, Pope was the cleverest of all epigram writers, and some of his poems are but strings of epigrams. The following are from his pen:

> Why has not man a microscopic eye?
> For this plain reason—man is not a fly.

> Vice is a monster of so frightful mien
> As to be hated needs but to be seen;
> Yet seen too oft, familiar with her face,
> We first endure, then pity, then embrace.

> But thousands die without or this or that—
> Die, and endow a college or a cat.

> Who builds a church to God and not to fame,
> Will never mark the marble with his name.

And the parodist who mocked at Pope told of his defects very concisely in an epigram:

> One line for sense and one to make the rhyme
> Make a good Popish couplet every time.

A quick and clever exchange of epigrams took place between Charles II and one of his courtiers, whose identity is uncertain.

Here lies our sovereign lord, the king,
Whose word no man relies on,
Who never said a foolish thing,
And never did a wise one,

wrote the courtier, to which Charles replied, "True, for my words are my own; my actions are my ministers'."

If the word be considered in its wider meaning, any of the proverbs are epigrams. The following are excellent examples:

All that glisters is not gold.—*Shakespeare.*
Hope deferred maketh the heart sick.—*Bible.*
A soft answer turneth away wrath.—*Bible.*

EPILEPSY, *ep'i lep si,* or **FALLING SICKNESS,** is a nervous disease which manifests itself in several forms. The epileptic who suffers from the most common type, called *grand mal,* falls insensible, uttering a wild scream, and immediately afterward undergoes convulsions of the whole body. Attending symptoms are foaming at the mouth and spasmodic movements of the lips, nostrils and eyes. The duration of such an attack varies from five to twenty minutes. As the convulsions gradually diminish in severity the patient passes into a condition of deep stupor, during which the breathing sometimes becomes very noisy. This state is followed by natural slumber, of varying duration. While such an attack may seem very alarming to the onlooker, it is not necessarily dangerous unless the patient injures himself in falling or bites his tongue during the convulsions. It is not wise to attempt restoration by means of powerful stimulants. The clothing may be loosened around the chest, and the head be raised a little, and the patient should have plenty of air. Sometimes an epileptic is warned of an approaching fit by noise in the ears, a feeling of nausea or faintness, loss of breath, or other sensation, but in many cases the attack comes on with no warning whatsoever.

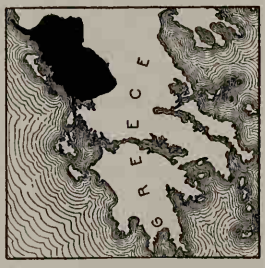
In *petit mal,* a less common form of epilepsy, the patient does not fall, but is unconscious for two or three seconds, and when he comes to himself he may not know that he has had an attack. Persons who suffer from *grand mal* sometimes have mild seizures that are of brief duration and are characterized only by slight twitchings of the body. Another form of epilepsy is the *psychic type,* some of the manifestations of which resemble those of insanity. Crimes are often committed by victims of psychic epilepsy. In some instances tumor of the brain, meningitis and similar disturbances cause spasmodic movements of a limited area.

There are many epileptics who have lived long and useful lives, and in history the names of a few victims of the disease shine brilliantly —Julius Caesar, Petrarch, Mohammed, Peter the Great and Napoleon. Impairment of the mental powers, however, is usually the outcome of *petit mal.* Frequency of attacks is a more serious feature of *grand mal* than severity. Recovery from epilepsy is rare, and the exact cause of the malady has long baffled physicians. It is supposed to be due to disease of the gray matter of the brain. Attention to hygiene and dieting is preferable to the use of curative drugs. Any drug powerful enough to control the spasms is sure to be demoralizing in its general effect. The disease is hereditary, and epileptics should not be allowed to marry. Several states have provided for colonies of epileptics, where rational treatment is resulting in lasting benefit to patients. W.A.E.

EPIPHANY, *e pif'a ni,* a festival observed on January 6 by the Roman Catholic, Anglican and Eastern churches in honor of the manifestation or presentation of Christ. Originally it commemorated the birth and baptism of Christ, but since the year 813 it has been celebrated as a special festival in honor of the manifestation of the Infant Jesus to the three *magi,* or wise men from the East, who were guided by the star to Bethlehem.

EPIPHYTES, *ep'i fytz.* See AIR PLANTS; PARASITES.

EPIRUS, *e pi'rus,* meaning *mainland,* was in ancient geography the extreme northwestern division of Greece. The kingdom of Epirus reached the zenith of its glory under Pyrrhus, in 295 B.C. It was invaded by the Albanians in the fourteenth century, was conquered by the Turks in the fifteenth century, and now forms part of the territory ceded to Greece in 1881 and 1913. The modern province of Epirus is bounded on the south by the Gulf of Arta and on the west by the Ionian Sea. Its capital, Janina, has a population of about 25,000.



EPIRUS

EPISCOPAL, *e pis'ko pal,* **CHURCH,** a religious sect in America, known as the Protestant Episcopal Church, which separated from the

Church of England in 1789 and prepared a constitution of its own. The prayer book adopted was nearly like that of the English Church, and in belief and organization the sect remained much the same. Although great effort was exerted to unite under this new organization the various bodies who owed original allegiance to the Church of England, the Church made very little progress until after 1811. Then the membership increased rapidly, and churches were established in thirteen states during the next ten years. The total membership in 1917 was nearly 1,000,000. The Church is governed by a general conference, which meets every three years and is composed of the bishops and four clergymen and four laymen from each diocese. Chief among the agencies within the Church which aid its work are eighteen sisterhoods, several orders of Deaconesses, and the Brotherhood of Saint Andrew, which enlists the active work of laymen and which has been very successful.

EPITAPH, *ep'i taf.* For ages past man has been accustomed to inscribe memorial words on the tombstones or other monuments placed above the graves of the dead. Such inscriptions are known as *epitaphs,* a term from two Greek words meaning *upon* and *tomb.* The term is also applied to literary memorials composed in honor of the dead, but not intended to be inscribed on a burial monument. The earliest-known epitaphs are those found on ancient Egyptian coffins, but these are simply statements of the name and family of the deceased, accompanied by a prayer to one of the gods, and there is no attempt to praise the character of the dead or to express the feelings of the survivors. The Greeks excelled in the composing of memorial inscriptions, those written by Simonides in honor of the heroes who perished at the Pass of Thermopylae being especially famous. Of these the most celebrated is the following:

Go tell the Spartans, thou that passeth by,
That here, obedient to their laws, we lie.

A well-known Latin epitaph is that in honor of Alexander the Great—"Here a mound suffices for one for whom the world was not large enough." Shakespeare himself is said to have written the quaint lines that are engraved on his tomb at Stratford, though poetically they seem unworthy of him:

Good frend, for Jesus' sake forbeare
To digg the dust enclosed heare;
Bleste be the man that spares thes stones,
And curst be he that moves my bones.

Of equal interest is the epitaph written by Benjamin Franklin for himself:

The body of
Benjamin Franklin, Printer,
Like the cover of an old book,
Its contents worn out,
And stript of its lettering and gilding
Lies here food for the worms,
Yet the work itself shall not be lost,
For it shall, as he believes,
appear once more,
in a new
and more beautiful edition
Corrected and amended
By the Author.

Robert Louis Stevenson lies under a mountain tomb in Samoa, upon which are inscribed the following noble lines from his own pen:

Under the wide and starry sky,
Dig the grave and let me lie.
Glad did I live and gladly die,
And I laid me down with a will.

This be the verse you grave for me:
"Here he lies where he longed to be;
Home is the sailor, home from the sea,
And the hunter home from the hill."

On the tombstones in the old English churchyards one may read many curious epitaphs. Over the grave of a useful member of the town of Weston appear these lines:

Here lies entomb'd within this vault so dark,
A tailor, cloth-drawer, soldier, and parish clerk;
Death snatched him hence, and also from him took
His needle, thimble, sword, and prayer-book.
He could not work, nor fight—what then?
He left the world, and faintly cried, "Amen!"

Near the west end of Holy Trinity Church, Stalham, Norfolk, there is a gravestone bearing this inscription:

John Amies, 1831.
Here lies an honest independent man,
Boast more ye great ones if ye can;
I have been kicked by a bull and ram,
Now let me lay contented as I am.

The epitaphs on the headstones in New England burial grounds are often quaintly philosophical. One departed sister, who sleeps in the graveyard of Rowley, Mass., thus admonishes the living:

Here in the silent grave I lie
No more the scenes of life to try,
And you, dear friends, I leave behind,
Must soon this gloomy mansion find.

In the famous old Boston cemetery called Copp's Hill Burial Ground is the following eulogy in verse, representative of many others:

This humble stone proclaims the truth—
Here lies a much respected youth
But now cut down in early prime,
And far beyond the ills of time
In brighter worlds and clearer skies
Shall all his manly virtues rise.

To the many people interested in collecting unusual records of the above nature the following books are recommended: Kippax's *Churchyard Literature: A Choice Collection of American Epitaphs;* Andrews' *Curious Epitaphs.*

E PLUR'IBUS U'NUM, the motto of the United States, is a Latin phrase which means *Out of Many, One.* It appeared first on the design for the Great Seal recommended to the Continental Congress by a committee composed of Franklin, Adams and Jefferson, on July 4, 1776. The motto is displayed on several coins, though it has never been officially approved for this purpose.

EPOCH, *ep'ok,* or **ERA,** a fixed period of time, and the arrangement or grouping of the various great events in the history of the world occurring within that period. The invention of the art of writing provided a means of making permanent records in place of mere tradition; necessarily, the history of the ages before that time is wrapped in obscurity. The Creation and the birth of Christ are the most prominent of the historical epochs. The Creation has formed the foundation of many chronologies, the foremost being the epoch adopted by Bossuet, Ussher and other Roman Catholic and Protestant divines; the *Era of Constantinople* (adopted by Russia); the *Era of Antioch;* the *Era of Alexandria,* and the *Abyssinian Era.* Although varying in date, each of these places the Creation somewhere between 4000 B. C. and 5500 B. C. The Julian period (the suggestion of Joseph Scaliger, in 1582), on account of the possibilities it affords in comparing the different eras with one another and in marking the years before Christ, is generally employed by chronologists. It is the only epoch established on an astronomical basis. The first year of the Christian Era corresponds with the year 4714 of the Julian period.

The Greeks computed their time by periods of four years, called *Olympiads,* from the occurrence, every fourth year, of the Olympic games. The first recorded Olympiad began in 776 B. C. The Romans dated from the supposed year of the founding of their city, April 21, in the third year of the sixth Olympiad, or 753 B. C. The *Jewish Era* places the Creation in 3760 B. C. The *Christian Era,* or mode of computing from the birth of Christ as a starting-point, was first introduced in the sixth century, and was generally adopted by 1000. The Mohammedans date from the *Hegira,* or the flight of the prophet from Mecca to Medina in A. D. 622. The years are computed by lunar months. For chronological purposes the Chinese, in common with some other nations of the East in Asia, employ cycles of sixty, by means of which they reckon their days, months and years. See CHRISTIAN ERA; CALENDAR.

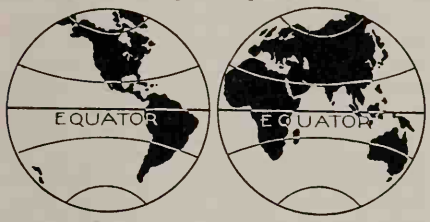
EP'SOM SALTS, medicinal salts composed of crystals of sulphate of magnesium, named after the town of Epsom, England, where it was originally obtained. The chief source of supply is now Stassfurt, in Saxony, where it is prepared from crude salt. It is used in medicine as a purgative and is also an important ingredient in aniline dyes. The War of the Nations cut off the European supply of the salts in 1914, and the deposits in Chile and in the states of Kentucky, Indiana and Tennessee, hitherto undeveloped, assumed great importance.

EP'WORTH LEAGUE, the young people's society in the Methodist Episcopal Church, organized at Cleveland, Ohio, in May, 1889, and officially recognized by the General Conference of the Church in 1892. It was formed by the combination of five young people's organizations in the Church for the purpose of promoting the interest of young people in spiritual life. The work of the League is organized under four departments, namely, the spiritual, the missionary, the social service, and the recreation and culture departments. Every member is assigned to one department and is expected to work in it. Classes in Bible study, missions, good citizenship and social service are formed among the members, and during the summer institutes lasting a week are held in various places. Any member may register to attend these meetings, where classes for study are held and lectures are given in the morning, while the afternoon is spent in recreation.

There are two grades in the League, the Senior and the Junior. Many local chapters add a third, or Intermediate, grade. The membership of the League, which extends not only all over the United States and Canada but also into several foreign countries, numbered about 900,000 in 1917. The headquarters are in Chicago, where the official organ, the *Epworth Herald,* has been published since 1890. D.B.B

EQUATOR, *e kwa'tor,* an imaginary circle girdling the globe at a distance of 90° from the North and South poles, and dividing the

surface of the earth into two equal parts called the northern and southern hemispheres. Degrees of latitude are measured from the equator north or south along imaginary lines running perpendicular to it and converging toward the poles, where they meet. Degrees of longitude are measured along the equator or lines running parallel to it. All places on the equator have days and nights of equal length all the year.



THE EQUATOR

It marks the center of the torrid zone; is 23½° from the Tropic of Cancer (to the north), and the same distance from the Tropic of Capricorn (to the south).

The *celestial equator* encircles the celestial sphere as the terrestrial equator encircles the globe. When the sun is in the celestial equator in spring and autumn, days and nights are equal all over the world. An irregular circle, the line of which runs sometimes north, sometimes south of the equator, is known as the *magnetic equator;* it is about 90° from the magnetic poles. On this line a magnetic needle has no inclination and remains horizontal when free to turn in any direction.

Related Subjects. The reader is referred to the following articles in these volumes:

Aclinic Line	Latitude
Equinox	Zone

EQUESTRIAN, ORDER, *e kwes' tri an,* originally the cavalry of the Roman army. Romulus is said to have selected from the three principal Roman tribes a bodyguard of 300 *equites,* or knights, called *celeres.* This number was afterwards gradually increased to 1,800. Until 123 B.C. the *equites* were exclusively a military body. After that time they became a distinct order, non-military in character, and constituted the financial aristocracy of Rome.

EQUINOX, *e' kwi nox,* in astronomy, the time when the sun passes across the equator in one of the equinoctial points; that is, one of the points where the ecliptic, or sun's path, crosses the celestial equator (see EQUATOR). This occurs twice yearly in the sun's apparent journey round the earth. In the spring the *vernal* equinox occurs March 21, the sun entering then what is known as the *first of Aries* (see ZODIAC). The *autumnal* equinox occurs September 22, when the sun enters the *first of Libra.* At these times day and night are equal all over the world. The equinoxes do not divide the year into two equal periods, as the sun, owing to its inclination on its axis, remains longer north of the equator than south of it.

Equinoctial, another name for the celestial equator. The equinoctial points, explained above, move backward at the rate of 50″ every year (see PRECESSION OF THE EQUINOXES). The term *equinoctial gales* is applied to the storms that are popularly supposed to be due to the sun's crossing the equator. There is no reason for such belief, however, and there is nothing in the position of the sun or its effect to cause storms at the equinoxes more than at any other time. C.R.M.

EQUITY, *ek' wi ti,* in legal usage, a body of laws that has been developed to supply certain deficiencies in the common law and to redress certain wrongs for which the common law originally offered no relief. The name is derived from the Latin *aequus,* meaning *fair* or *equal.* The rules of common law, as they were shaped in the early English courts, were intended for universal application, and were accordingly too broad to be applied easily to certain individual cases where injustice was apparent. This resulted in the practice of appealing to the king for relief. Such appeals became so numerous that in the reign of Edward III they were finally referred to a court of chancery.

A typical equity case of early times will serve to show the nature of the relief that was sought. At the time when the common law was being formulated property consisted almost wholly of tangible property, such as lands and goods. Therefore the common law provided that debts might be collected by securing judgment and execution. Later on, however, many other and less tangible forms of wealth appeared, such as contracts, securities, patents, etc., and these could not be seized under the common law. Courts of equity would entertain petitions asking that such intangible property be applied in payment.

The court of chancery established in Edward III's reign remained separate and distinct from the courts of law until 1873, when it became a division of the High Court of Justice. In the United States, chancery courts were in existence in most of the states at the end of the Revolutionary War, but since then they

have been abolished in many states, law and equity being administered by the same judges and courts. In Canada there were originally separate courts of king's bench, *common pleas* and *chancery,* but these have been abolished, and one court can try and determine any case of law or equity that comes before it in due process of law. An exception to this occurs in Prince Edward Island, where the chancery court is still in existence as a separate tribunal.

That equity courts aim at justice is apparent from some of the maxims they have developed: "Equity considers that done which ought to be done"; "No right without a remedy"; "He who seeks equity must do equity." Originally the judges had to consult very largely their abstract ideas of justice in rendering decisions, but in time a great body of precedents and a number of guiding general principles came to be recognized. Courts of equity grant injunctions, clear up defective titles to real estates, appoint receivers, etc. R.E.B.

Related Subjects. The reader is referred to the following articles in these volumes:

Chancery	Execution
Common Law	Judgment
Courts	Law

ERASMUS, *e raz' mus,* DESIDERIUS (1467-1536), the most learned, versatile and beloved of all the scholars who brought about the Renaissance (which see). Few other men of letters have wielded an influence during their own century equal to that exercised by him, yet he was not a creative genius, and he produced no single work which ranks among the world's masterpieces.

He was born at Rotterdam, Holland. Soon after he was ordained to the priesthood he entered the University of Paris. He was seldom connected with any institution of learning, and spent most of his life in France, England, Holland and Italy. Not long after the invention of printing he gave to the world the Greek Testament and a multitude of classical authors in Greek and Latin. His masterpiece, *Colloquia,* of which the first edition appeared in 1519, consists of a series of dialogues on the everyday topics of the time—social, religious and educational. He was intimately associated with Martin Luther, but when the Reformation broke out he gave adherence to neither party. In his *Adagia* and *The Praise of Folly* he showed the need of a general reform in the Church, and because of his stand he became involved in a series of distressing controversies.

Erasmus also contributed considerably to the advance of education. Despite his many conflicts, he enjoyed the friendship of the greatest minds of the day as well as of the crowned heads of Europe, who were proud to do honor to this farsighted scholar, reformer, philosopher and critic.

EREBUS, *er' e bus,* in Greek mythology, is the name of one of the sons of Chaos. The word signifies *darkness,* and is used especially to denote the dark and gloomy cavern beneath the earth to which no gleam of sunshine ever penetrated and through which the shades (spirits of the dead) passed on the way to Hades. It was over this mysterious world that Erebus reigned. Nyx, his sister, represented Night, and was worshiped by the ancients with the greatest solemnity.

ERECHTHEUM, *er ek' the um,* a temple on the Acropolis at Athens, considered the most refined example of Ionic architecture. It was called after Erechtheus, to whom a portion of it was dedicated. It contained the ancient

THE ERECHTHEUM
As it appears to-day.

image of Athene, the salt spring of Poseidon, the sacred olive of Athene, and three altars, one to Poseidon and Erechtheus, one to Butes and one to Hephaestus. It also contained the gold lamp of Callimachus, which burnt for a year without refilling, and had a chimney in the form of a palm tree. The building is square, with porticoes on three sides. The east portico is adorned with six Ionic columns. On the south side at the west end is the famous Porch of the Caryatides. The Erechtheum was damaged by fire soon after it was completed in 406 B.C., but was repaired early in the following century. In Christian times it was used as a church, and under Turkish rule as the harem of the governor of Athens. Since 1900 the project of rebuilding the Erechtheum has been considered. See CARYATIDES; ATHENS.

ERFURT, *er' foort,* a city which may properly be called the home of German flower

seeds, is situated in Prussian Saxony. In the fifteenth century its woolen and linen manufactures raised it to the position of the most important commercial town of Central Germany. It is now noted principally for the fact that there are more flower seeds grown in and around Erfurt than near any other city in the world; this alone gives it an extensive trade. An area of about 2,000 acres, growing nearly 9,000 varieties of flowers, are under cultivation; 750 acres of this area are under glass. Nearly all the floral novelties of merit, except the Burbank varieties, which are offered to the world can be traced back to Erfurt.

Erfurt boasts of several fine churches, chiefly of Gothic architecture. The town has had a stormy history, being either the source of disturbances between the electors of Mainz and Saxony or the object of attack by foreign invaders. From 1378 to 1816 it was a university center, of which the Academy of Sciences and the library of about 60,000 volumes and 1,000 manuscripts alone remain. The monastery, now an orphanage, is famous as having been once the residence of Martin Luther. The manufactures are varied, including cloth of various kinds, machinery, shoes, lamps and chemicals. Population in 1910, 111,461.

ERGOT, *ur'got,* a name given to hard, purplish bodies, replacing grain in heads of rye. They are caused by a growth of fungus, are usually much larger than the seeds they replace, and they contain an oily fluid. The principal supply is derived from the grain-growing districts of Russia. Ergot is poisonous, but it is largely used in medicine; it is dangerous in its action on the heart, and never should be taken except under the direction of a physician.

ERICSSON, *er'ik son,* JOHN (1803-1889), an inventor and engineer, who revolutionized naval warfare. Except for him history would not have recorded the critical battle between the *Monitor* and the *Merrimac* during the War of Secession. He was born at Wermland, Sweden, July 31, 1803. In 1828 he made the first application to navigation of the principle of condensing steam and returning the water to the boiler. He also invented a self-acting gun-lock, by means of which naval cannon could be discharged automatically at an elevation without regard to the rolling of the ship. His chief inventions are his caloric engine, the screw propeller, which revolutionized navigation, and his turret ships. He moved to the United States in 1839 and two years later built the warship *Princeton* for the government. This was the forerunner of the steam fighting ships of the world.

The achievement which made him most famous was the construction of the iron-clad turret ship *Monitor* in 1861, which arrived in Hampton Roads on March 9, 1862, just in time to defeat the Confederate ironclad *Merrimac.* In his later years Ericsson attempted to perfect the solar engine. The centenary of his birth was observed in 1903 in New York by the unveiling of a bronze statue of the inventor in Battery Park; another fine statue was erected at the same time in Worcester, Mass. See MONITOR AND MERRIMAC.

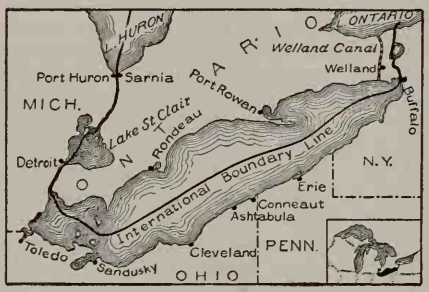
JOHN ERICSSON
Builder of the famous *Monitor,* one of the first iron-clad fighting vessels.

ERIC, *er'ik,* **THE RED** (950?-1000), a Norse explorer and the colonizer of Greenland, was born in Norway, from which country he was compelled to flee to escape a charge of murder. He settled on the west coast of Iceland where, in 984, he was again accused of murder. He then sought refuge in an island which had been discovered a century before, but not settled. In 985 he returned to Norway to secure colonists and supplies for the new settlement, which he called Greenland. This colony did not long survive on the inhospitable shores. His son, Leif Ericson, introduced Christianity into the island, and is credited by some with the discovery of the continent of North America, which he called Vinland. See GREENLAND.

ERIE, *e'ri,* LAKE, the southernmost of the five great North American lakes drained by the Saint Lawrence River. It receives the waters of Lake Huron through the Saint Clair River, Lake Saint Clair and the Detroit River, and discharges through the Niagara River into Lake Ontario. It is 240 miles long and forty miles broad, and covers an area of 9,960 square miles, about that of the state of Vermont. Its surface is over eight feet lower than that of Lake Huron and twenty-nine feet lower than that of Lake Superior (for diagram showing elevations, see GREAT LAKES). Owing to the shallowness of its waters, nowhere more than 200 feet deep,

the lake is quickly stirred by storms and is noted for the violence and height of its waves. The whole of the northern shore is Canadian territory; the southern belongs to the United States. The international boundary divides the lake into two nearly equal parts.

As a commercial highway the lake is of great importance. More tonnage is carried in vessels across Lake Erie in the three months during which grain is being moved from the northwest of America than passes through the Suez Canal in an entire year. The old Welland Canal affords passage for small vessels into Lake Ontario, and when the new canal is completed the largest vessels will be able to pass through it. The New York State Barge Canal (which see) connects Lake Erie with the Hudson River. The principal ports are Buffalo, the great wheat depot for the East; Toledo, Cleveland, Erie and Ashtabula. Navigation is almost entirely suspended during winter. There are numerous islands in the lake, evenly divided between the United States and Canada. The fisheries of Lake Erie are important, the



LAKE ERIE

lesser whitefish being the most valuable food fish. The value of the annual catch is estimated at more than $1,000,000.

Battle of Lake Erie. In the War of 1812 between Great Britain and the United States a naval engagement was fought on September 10, 1813, off Put-in-Bay, near the western end of Lake Erie. After the battle was over, the American commander, Oliver Hazard Perry, wrote on the back of an old letter a message which has become famous: "We have met the enemy and they are ours—two ships, two brigs, one schooner and one sloop. Yours with great respect and esteem, O. H. Perry."

The British had six vessels, under the command of Robert Barclay, a veteran of Trafalgar, while Perry commanded nine. The British at first concentrated their fire on Perry's flagship, the *Lawrence*, named in honor of the brave captain of the *Chesapeake*. The *Lawrence* bore the brunt of the battle until only Perry, his twelve-year-old brother, and eight of the crew

BATTLE OF LAKE ERIE

Reproduction of a famous painting by W. H. Powell, now hanging above the landing in the staircase in the Senate wing of the Capitol, Washington, D. C.

were left alive. As the flagship was completely disabled, Perry, with his flag in hand, jumped into an open boat, and was rowed across, under heavy fire, to the *Niagara*. The engagement then became general, and three hours and fifteen minutes after the first gun was fired the British squadron surrendered. The Americans lost 123 men in killed and wounded; the British, 135. Perry's victory was important because it gave the Americans control of the lower end of the Great Lakes, compelled Proctor to withdraw from Detroit, and opened the way for General Harrison's invasion, which ended at the Battle of the Thames. T.E.F.

ERIE, Pa., the only lake port of the state, an important railway and industrial center and the county seat of Erie County. It is situated on Lake Erie, on the northwestern boundary of the state, eighty-eight miles southwest of Buffalo, N. Y., ninety-five miles northeast of Cleveland, O., and 148 miles north of Pittsburgh. The city is served by the Bessemer & Lake Erie, the New York, Chicago & Saint Louis, the Pennsylvania and the New York Central railways. Large steamboats ply regularly between Erie and other ports on the Great Lakes, and interurban lines connect with cities as far east as Buffalo, west to Cleveland and south to Meadville, thence west to Linesville. A Federal estimate in 1916 gave the city 75,195 people, an increase of 8,670 since 1910. The area of the city exceeds seven and one-third square miles.

Commerce and Industry. Extensive coal and coke districts in the vicinity and a supply of natural gas increase the commercial and

industrial importance of the city. Besides large exports of coal and iron, there are extensive fisheries and a heavy trade in oil, lumber, agricultural and manufactured products and package freight. The harbor is the largest on the lake, being four miles long and one mile wide, and is protected by the peninsula called Presque Isle, six miles long and one mile wide. Three lighthouses stand at the entrance to the harbor, and substantial wharves extend along the entire front.

The manufactures of Erie are important and varied, the annual output being valued at more than $30,000,000. About 16,000 people are employed in the 450 industrial establishments, the most extensive of which are steam-engine and boiler works. There are manufactories of iron and brass products, paper, railroad cars, rubber goods, air compressors, brick hollow-ware, electrical supplies and agricultural implements; besides these, there are planing mills, oil refineries, tanneries, flour mills, breweries, chemical works, boat-building plants and grain elevators.

Parks and Boulevards. Erie is located on a bluff which affords a fine view of the lake, and though it is principally a commercial city, it has many beautiful parks and broad streets, lined with handsome residences, fine trees and attractive gardens. About 325 acres are assigned to parks, which contribute much to the beauty of the city, the largest of these being Waterworks Park on Presque Isle, of 150 acres; Waldameer Park on the lake shore is one of the most beautiful natural parks of the country. The Cedars and Lake Side parks are among the pleasure resorts of the city, and Cambridge Springs is a noted health resort in the vicinity.

Buildings and Institutions. The most notable buildings are a Federal building, erected in 1888, a city hall, a courthouse, a $550,000 Commerce Building, constructed of reënforced concrete, a Union Depot, two cathedrals, a Y. M. C. A. building and a Masonic Temple. The benevolent institutions include two hospitals, a sanitarium, eight homes for children and aged people and the Pennsylvania Soldiers' and Sailors' Home.

Education. The public school system of the city, with two high schools and a normal school, is supplemented by Saint John Kanty College; Saint Benedict, Villa Maria and Erie academies, a library with 30,000 volumes, and two business colleges.

History. The old French Fort Presque Isle stood on the site of the present city of Erie in 1753. The English took possession of it in 1760, but during the war of 1763 a large force of Indians compelled the garrison to surrender. The town was laid out and settled by some families from New England in 1795. During the War of 1812, the town was the headquarters of Commodore Perry; the two flagships with which he defeated the British in the naval Battle of Lake Erie, off Put-in-Bay, were built and equipped here, and to Erie the victorious fleet returned with its prizes and prisoners. The town was incorporated as a borough in 1805 and in 1851 was chartered as a city. In 1913 the commission form of government was adopted, with a mayor and five other elective officers. J.S.C.

ERIE CANAL, the first important waterway constructed in the United States, whose completion, in 1825, marked the beginning of a new era in the economic and commercial history of the American people. It extends from

ROUTE OF THE ERIE CANAL
The original canal is now a part of the New York State Barge Canal System.

Buffalo to Troy and Albany, N. Y., connecting Lake Erie with the Hudson River, and originally was 363 miles long, twenty-eight feet wide at the bottom, forty-two feet wide at the top and four feet deep. This great public work, which was built by the state of New York at a cost of over seven million dollars, was for years the main channel through which the raw products of the developing West found their way to New York, and over which the finished products of the East were carried back to Western consumers.

Not only was it the chief single factor in establishing New York City as the leading commercial and financial center of the country, but it was responsible for the building up of a chain of towns and cities through the commonwealth, thus contributing in no small measure to the prosperity and growth of the "Empire State." Between the year 1817, when the work was begun, and 1882, when tolls were abolished, the total revenue from operating the canal amounted to $121,461,891, and during the first ten years after its completion transportation

charges from Buffalo to Albany fell from $22 to $4 per ton.

History. The Erie Canal was not the result of a decade of planning and agitation, nor of a quarter century. One hundred years before it was completed farseeing men of the colonies had visions of a system of waterways which would help take care of the westward tide of migration, and as early as 1777 Gouverneur Morris, of Revolutionary fame, predicted that one day the waters of the Great Lakes would mingle by way of a canal with those of the Atlantic Ocean, and that ships would sail from London to America's inland seas by such a route. Through the efforts of George Clinton, first governor of New York, a comprehensive survey of the Mohawk Valley was made in 1791, and a year later the Western Inland Lock Navigation Company was chartered. By 1796 this corporation had completed six miles of canals at or about Little Falls, to increase the facilities of the upper Mohawk River; this waterway could be navigated by vessels of sixteen tons. Thus the pathway to a greater project was opened.

In 1816 Governor Tompkins of New York appointed a canal commission and urged that a waterway from the Hudson River to Lake Erie be built at once; at the head of the commission he placed a man whose name is forever connected with the success of the enterprise—De Witt Clinton, nephew of George Clinton. De Witt Clinton was himself inaugurated governor of the state in 1817, and served during most of the time the canal was under construction. To the completion of this project he devoted his untiring efforts. Three days after his inauguration he broke ground for the canal at Rome, then a thriving village on the Mohawk, and for the next eight years an army of workmen toiled in the rough, unbroken country between the Hudson and the Great Lakes, cutting down trees of the forests, blasting their way through rocky ledges, building stone aqueducts to carry the canal across streams and constructing the great locks made necessary by the upward slant of the land.

On October 26, 1825, the *Seneca Chief,* the first boat to make the trip through the completed canal, left Buffalo for New York City. On board were several of the state's most distinguished citizens, including Governor Clinton. The pealing of bells, the booming of cannon and the shouts of enthusiastic people greeted the boat all along its route, and its arrival in New York was the occasion of an imposing celebration. The news of the opening of the canal was sent from Buffalo to Sandy Hook, a distance of over 500 miles, by means of cannon placed at appropriate distances along the way, the sound of each gun being the signal for the firing of the next one. The telephone and telegraph were not then invented, and it was eighty-one minutes before the people of New York knew, by the booming of the last cannon, that commerce had begun on the new waterway.

The original Erie Canal cost the state $7,143,789 to build, and could carry boats eighty feet in length, fifteen feet in width and of three and one-half feet draft. It was not long before its increasing business made a greater capacity necessary, and in 1835 its enlargement was authorized. By 1862, after a series of improvements had been made, the canal was seventy feet wide at the surface, fifty-two feet wide at the bottom and seven feet deep, and could accommodate 240-ton vessels of six-foot draft. Soon after the close of the War of Secession the competition of the railroads began seriously to be felt, and the entire canal system of the state suffered a period of decline and neglect. Though an expenditure of $9,000,000 for improvements was authorized in 1895, the changes made proved to be only of temporary value, and the whole subject came up again for discussion and legislation. In 1903, when a bond issue of $101,000,000 was ratified by popular vote, there began a new era in the history of the Erie Canal. For an account of the later improvements and their commercial significance, see the article New York State Barge Canal. T.E.F.

ERIS, *e'ris,* in classic mythology, the goddess of discord and the sister of the war-god Mars. In the legend of the Trojan War Eris is the goddess who, indignant that she was the only one of all the gods and goddesses who was not invited to the marriage festivities of Peleus and Thetis, threw into the midst of the guests a golden apple—known ever since as the "apple of discord"—which bore the inscription, "For the fairest of the fair." The rivalry of the three deities—Hera, Athene and Aphrodite—for the gift was left to the judgment of Paris, the son of the king of Troy, who, being appointed umpire by Zeus, bestowed it on Aphrodite.

In the *Iliad,* Eris, or Strife, is described at first as insignificant, but as swelling until her head touches the heavens. In the *Aeneid* she appears under the name of Discordia.

ERMINE, *ur'min,* or **STOAT,** *stote,* the name given to any weasel of cold climates which turns white in winter; it is generally applied to the animal only at that time. Sometimes the word is used only with reference to

THE ERMINE
(*a*) Summer coat; (*b*) winter coat.

the fur. From a reddish-brown, the short, soft, silky fur of this animal changes to a yellowish-white in normal winter weather, or to a pure white in extreme cold. The very tip of the tail is always black, however. The trapping of ermine requires great patience and exposure to bitterly-cold weather. Not a great many skins are taken yearly; a large part of the fur now sold as ermine is merely the fur of the white rabbit.

As an ordinary trap would tear the delicate fur of the ermine, a knife-trap is used. That is, an ordinary hunting knife, greased, is placed in the snow to lure the animal by its resemblance to ice, which it seldom fails to lick. At very low temperature the tongue of the little animal freezes to the steel blade, and the hunter easily secures his victim. It is estimated that to the trapper ermine pelts, sold in quantities, bring from 30 cents to $2.50 each, but that is before the expensive process of dressing has been applied. When all ready for use, a stole of the softest, whitest ermine often commands as high as $1,000, for one pelt is only about twelve inches long, and one commercial fur requires many young ermine. The best skins are secured in Northern Canada, Russia, Sweden and Norway. Ermine is used for neck pieces, muffs, trimming of various garments, linings of coats and for trimming robes of judges. It is an emblem of royalty, and various ranks of nobility were at one time designated by the arrangement of the black tail-tips.

E'ROS. See CUPID.

EROSION, *e ro'zhun.* If we examine the slopes of a cut along a railway or where a road has been graded, we find a large number of little ruts in them. When the cut was made these slopes were smooth. How were the ruts formed? Let us study the slope during a shower. We soon discover little streams running down the ruts, and we also notice that each stream is carrying some of the earth along with it, so that each succeeding shower makes the ruts larger, until, in time, they may become tiny valleys. This wearing away of the land by water or any other agency is called by geologists *erosion.* Erosion is caused by rain, by running water, by wind and by ice.

Rain. Rain water contains small quantities of ammonia, nitric acid and sometimes muriatic acid. These substances decompose the rocks upon which the rain falls, and thus form sand or soil which the rain may carry to lower levels. Although this decomposition of the rock is very slow, in the course of ages it causes important changes on the earth's surface.

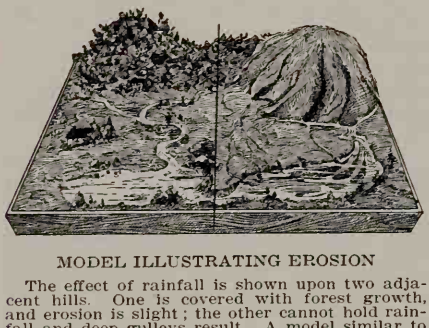
Running Water. We have shown how running water wears away the land on a small scale. Now in place of the tiny stream formed by a shower, let us consider a mountain stream and a river. As the stream flows down the land slopes it gathers speed, and flows much faster in the lower part of its course than where it begins. This increase in speed gives the water increased power, so it wears its channel more rapidly in the lower than in the upper part of its course. It also carries heavier and coarser material. Hence we find that valleys formed by mountain streams increase in depth as they extend down the slope, and because the lower part of the valley is formed rapidly its sides are usually steep.

Large rivers usually flow over more gentle slopes, and form wide valleys with gently-sloping sides. Moreover, the river carries down much of the fine soil and sand brought to it by the numerous mountain streams. As it reaches the lower levels it deposits this material on its bed and banks and at its mouth, where it may form great deltas, like those at the mouth of the Mississippi. The low, flat land along river banks is formed in this way. Some of the grandest features of natural scenery are the result of river erosion. The Grand Canyon of the Colorado and the Canyon of the Yellowstone were formed in this way.

Influence of Forests. Rain falling upon bare slopes strikes the ground with greater

force than that falling upon slopes covered with vegetation, because the foliage breaks the force of the falling water. The sod formed by roots of grass and the matting of decayed leaves in the forest also absorbs a good portion of the water and allows it to sink into the ground, thus preventing floods. Moreover, a portion of the water absorbed by the earth reappears in springs and streams, feeding them slowly and continuously. Thus forests are valuable agencies in preventing the destruction of the land by erosion, and they should be carefully preserved. This action is shown in the illustration.

Atmosphere. The atmosphere is constantly wearing away the surface of rocks in two ways —by decomposing them and by the action of



MODEL ILLUSTRATING EROSION

The effect of rainfall is shown upon two adjacent hills. One is covered with forest growth, and erosion is slight; the other cannot hold rainfall and deep gulleys result. A model similar to the above can be made for any school.

wind. The decomposition is so slight, however, that it needs no attention here. Wind, especially in the arid regions, is constantly wearing away the surface of the rocks, and in many places wonderful figures are formed in this way. The remarkable natural sculptures found in the Garden of the Gods, Colorado, and in portions of the Bad Lands in South Dakota were formed by the action of wind. Sand dunes, wherever they occur, are also good examples of changes wrought by wind.

Ice. We are familiar with banks of sand and gravel thrown up by ice on the shores of small lakes, but we do not see the actual wearing away of rocks by ice, except in those regions where glaciers are found, as in the Rocky Mountains and the Alps. In the Glacial Period, however, extensive erosion was caused by ice. While erosion was more rapid and more extensive in past geological ages than at present, all forms of it are still active, and may be studied on a small scale in almost every school yard and on every farm. C.R.M.

Related Subjects. The reader is referred to the following articles in these volumes:

Alluvium	Glacial Period
Canyon	Grand Canyon of the Colorado
Delta	River
Dune	Valley
Geology	

ERYSIPELAS, *er i sip' e las,* sometimes called SAINT ANTHONY'S FIRE, is a very infectious disease. The name is derived from two Greek words meaning *red skin,* extreme redness and inflammation of the skin being the most noticeable symptoms. The disease is caused by germs which enter the skin through a scratch or cut. It usually appears upon the head or face, and begins with a chill, followed by headache, loss of appetite and a general feeling of illness. The disease does not usually prove fatal. If the infected parts are treated with antiseptic dressings, and the patient takes a tonic, such as iron, strychnine and quinine, improvement will be seen in a few days. Some physicians paint the edges of inflamed spots with collodion, to prevent the spread of the malady. W.A.E.

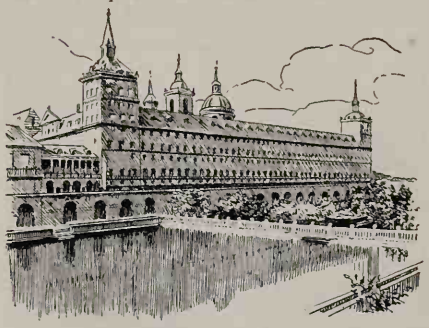
ESAU, *e' saw,* the skilled hunter who sold his birthright to his twin brother Jacob for a bowl of red pottage, because he was hungry when he returned from the chase (*Genesis* XXV, 27-34). Later Jacob, who was jealous of Esau because their father, Isaac, favored him, succeeded in obtaining the parental blessing by deceit, but left the country to escape his brother's anger. Esau with his three wives went to live on Mount Seir, where his descendants formed the nation called the Edomites. Twenty years later Jacob returned and obtained forgiveness for his actions. The reconciliation between the brothers was permanent.

ESCANABA, *es ka nah' bah,* MICH., the county seat of Delta County, on the eastern shore of the upper peninsula, seventy-three miles southeast of Marquette. It is on a promontory at the mouth of Escanaba River, on Little Bay de Noquette, an inlet of Green Bay; the city has a fine harbor. It is on the Escanaba & Lake Superior, the Minneapolis, Saint Paul & Sault Sainte Marie and the Chicago & North Western railroads. In 1910 the population was 13,194; in 1916, 15,485. The area is eight square miles.

Escanaba was settled in 1863, and was incorporated as a village and chartered as a city in 1883. Picturesque surroundings and excellent fishing and boating have made it a popular summer resort. It contains a courthouse, city hall, public library and a hospital, and is one

of the important ore-shipping ports of the lakes, with especially constructed ore-docks, handling 4,000,000 tons annually. There is also an extensive trade in lumber, fish and coal. The industrial plants of the city include railroad repair shops, furniture, flooring and wooden-ware factories, an ore-crusher and a tie-preserving plant.

ESCORIAL, *es ko' ri al.* Twenty-five miles from Madrid, Spain, is an enormous building, a church, palace and mausoleum, erected by the tyrant Philip II between 1563 and 1584, to the honor of Saint Lawrence, the saint who was roasted on a gridiron. Philip's soldiers having defeated the French on Saint Lawrence's Day, he decreed that this monument be designed in the form of a gridiron. The Escorial is built on a barren hillside, and John L. Stoddard says of it, "There never was, and I hope never will be, a gloomier building." It was begun in 1563 and finished eleven years later. Philip and all but two of his successors



THE ESCORIAL

were buried in it. The main entrance is opened but twice for each king—on his first visit and when his dead body is carried in.

ESKIMO, *es' ki mo,* a race of sturdy little people who, dressed from head to toe in warm skins and furs, make their homes principally in North America, in the great snow-and-ice area within the Arctic Circle.

No one knows precisely their origin, but many things about their features, legends and language seem to indicate that they are a primitive American race related to the Indians. Some students, however, believe them to be a branch of the Mongolian family which migrated many centuries ago from Asia into Alaska. The name *Eskimo* is an Algonquin word meaning *eaters of raw flesh,* but they call themselves *Innuit,* meaning *the people.* Although they are scattered over Greenland, Alaska, Labrador, the islands of the Arctic Ocean and parts of Asia bordering on the Bering Sea, the same language is spoken by all the different groups.

Their Appearance and Dress. The Eskimos are rather fat and squat in build. They have wide, oval faces, high cheek bones, flat noses, oblique eyes, straight hair, jet-black in color, and a light-brown complexion—when it is clean! They never wash, however, and the older they grow, the darker and greasier they become.

In the intense cold of the polar regions skins and furs are needed for outdoor wear all the year. Underclothing and stockings are made of the fine skin of the young reindeer. The children sometimes wear bird-skins underneath, with the warm, downy feathers next to their bodies. Trousers of deer or sealskin are tucked into high boots, which are of reindeer skin for winter wear and waterproof sealskin for summer. Several fur jackets are usually worn, the outer one made with a hood. An Eskimo will sometimes wear an extra jacket of fish-skin, which he has been known to eat in an emergency. Boys and girls are dressed alike, and there is very little difference between the costumes for men and women, except that the woman's hood is larger, like a long pocket, and she can carry her baby tucked snugly away in its warm folds.

Their Unique Houses. No trees grow in the far north, but the simple dwelling of the

Eskimo serves even better than a house of wood to keep out the cold. It is a snow house, called an *igloo*—the Innuit word for *house*—

ESKIMO CHILDREN
The boy at the left and the girl at the right are clothed practically alike from head to foot.

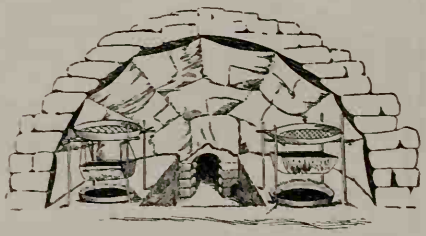
and it forms an important chapter in the story of how man is able to triumph over nature. To build it the Eskimo first saws thick blocks of snow out of a deep, solid drift, taking the circular hollow thus made as the main room of the house. Then the blocks, with snow for cement, are placed in spiral fashion to form the walls. This results in a low, domed hut, partly underground, looking something like a bee-hive (see illustration). It is entered by a long, narrow tunnel, so low that the family must crawl through on hands and knees. Off this passage are the storerooms. Light filters in through the snow walls of the igloo, but sometimes there is a window, with a thin sheet

A WINTER HOME

of ice instead of glass. Air is admitted through a hole at the top of the dome and through the chinks between the blocks.

In Alaska one often sees permanent winter houses built of driftwood, whaleribs, stones and turf, banked with snow, but these materials are not available in all parts of the Eskimo country. In the spring they become too damp for use and are deserted until the next winter.

The Eskimo has no stove such as we know, but he has a very wonderful lamp that gives a good deal of heat as well as light. Upon this lamp depends the family's comfort through the long winter night, lasting almost six months. It is usually made of soapstone, in the shape of a clam shell, has a wick of moss, and burns oil obtained from the blubber of the seal. In the summer the blubber is chewed to extract the oil, and in the winter it is frozen and beaten for the same purpose. The lamp, burning without smoke, makes the igloo so warm that very little clothing is needed; indeed, the heat is great enough to melt the snow walls, which are generally lined with skin in order to protect the inmates from the dripping. When the summer comes and the snow house



INTERIOR OF WINTER HOME

is no longer inhabitable, that same skin will be used for the family tent, for during the summer season the Eskimos keep moving from place to place, hunting game. The furnishings of the igloo are of the simplest kind, consisting mainly of a long bench used both for lounging and sleeping, with whalebone dishes and knives, cups, bottles and baskets of sealskin and other primitive utensils.

What They Eat. The "little frosty Eskimo," as the poet Stevenson calls him, is not "fed on proper meat," but gets plump and strong—and greasy—on a steady diet of fat and oil. In winter the flesh of seal or whale forms the chief dish, with a very little of the precious blubber or fat, that also provides light and fuel. The menu is sometimes varied by walrus or narwhal. It is this fatty food which enables him to endure the severe cold, for fat is a great heat-maker for the body. In summer the hunters travel long distances to find

bear, deer, foxes, hares and birds; some of these delicacies are stored away for the winter. Occasionally the meat is cooked over the lamp, but more often it is eaten raw. Eskimos have enormous appetites, and it is said that two of them can easily consume a small seal in one meal.

How They Travel. The dog is the Eskimo's horse, and the sledge is his moving van, family carriage, automobile and railway train. It can be used all the year except in Southern Greenland. Driftwood, when it can be obtained, makes the runners, which are connected by bone or ivory bars tied with rawhide. However, if you were to go to Eskimo-land you would see many strange substitutes used in sledge-making; for instance, rolls of skins sewed in a bag which is frozen into the right shape, or packs of fish, and even blocks of ice for the body, with frozen fish for runners and the spreading antlers of a deer for a back rest. Four or eight strong, well-trained dogs are harnessed to the sledge with rawhide and are governed by a whip with a very long lash which the driver uses with great dexterity. Those who have read Jack London's *The Call of the Wild* have a fine word-picture explaining how the teams are managed and how careful the driver must be to keep perfect discipline. If one dog bites his neighbor, the second dog takes revenge by biting the one next to him, and so on through the whole pack, until there is a general fight which is likely to result in injured dogs and tangled harness.

Snowshoes are a great help in overland travel. For travel by water the Eskimo has the *kayak,* or fishing boat, and the *umiak,* or family boat, sometimes called the woman's boat. The kayak is a very light canoe made

TWO FORMS OF THE KAYAK

of skin stretched over a frame of bone or wooden ribs. It is often as long as twenty feet, but never more than twenty inches in width. The round opening in the middle where the paddler sits has a sort of cuff which he can button around him to make the boat absolutely water-tight (see illustration). When a boy is ten years old he is taught to use the kayak, and he learns to handle it with marvelous skill, often capsizing it on purpose in order that the bottom may take the shock of a heavy wave, and then quickly righting it again. The umiak is large enough to hold the entire family and all the household belongings. It is flat-bottomed and has a sail as well as paddles.

Occupations and Amusements. The Eskimo must fish and hunt very diligently in order to keep himself and his family supplied with food, clothing and the materials required for their implements. He uses the spear and the harpoon for killing polar bears, seals and whales, and for land game sometimes a modern rifle is employed. In Greenland and Alaska the Eskimos engage in trade with the whites, selling skins, ivory, whalebone and eiderdown.

They are a fun-loving people, fond of music, story-telling and games. One of their favorite pastimes somewhat resembles football, and other popular games are throwing stones at a target, card-playing, wrestling, tossing a perforated bar and catching it on an ivory point, racing, and the like. The children have plenty of sport with tobogganing, hockey, snow-shoeing and snowballing, and they "play dog" with their small sledges and deerskin reins, just as other little boys and girls "play horse."

Character, Religion, Government. Missionaries have brought a great number of Eskimos into the Christian faith, but those who have not been converted still worship the "whale-spirit," and believe in the sea-demons which figure in their folk-tales, and in the power of the "medicine-men" to keep them under control. They are extremely peaceful in disposition, always good-natured, kind and hospitable, readily sharing their goods with one another. Although they live in small groups or villages, there is no central government of any kind, the only rule being that of the family. There is great good-feeling among the different groups, and no one has ever heard of one village making war upon another.

The Eskimo race is apparently dying out, and to-day there are fewer than 30,000 in existence. This is due largely to their ignorance of hygiene, and the introduction of contagious diseases by white visitors, which make it a rare thing for an Eskimo to live to an age of more than sixty years. L.F.

Consult Stefansson's *My Life with the Eskimos;* Nansen's *Eskimo Life;* Murdock's "The Point Barrow Eskimo," in *Ninth Annual Report of the Bureau of Ethnology,* published for the Smithsonian Institution. The latter is a government document.

Related Subjects. The reader who is interested in the Eskimos, their home countries and their mode of living, will find helpful material in the following articles in these volumes:

Alaska	Indians, American
Aleutian Islands	Labrador
Aleuts	Seal
Greenland	Whale

ESKIMO DOG, the beast of burden of the Arctic regions, a strong and fierce member of the dog family, descended from the wolf. It is usually yellow or light gray in color, with

ESKIMO DOG

an outer covering of long hair and woolly fur beneath. The pointed muzzle, pricked ears and bushy tail give it a very wolflike appearance. It is easily trained to hunt and to draw sleighs carrying heavy loads. The Eskimos usually harness from four to eight dogs, abreast, and under favorable conditions these animals will travel sixty miles a day. In Alaska it is customary to harness these dogs, which the white men call "huskies," in single file, usually five or six in a team; often they are harnessed two abreast. In Labrador, six, nine or twelve dogs are used for each sleigh, usually harnessed three abreast. The value of an Eskimo dog varies considerably, ranging from $10 or $15 to as much as $50 or even more, according to strength, training and disposition. Eskimos feed their dogs almost entirely on fish and refuse, but dogs employed by white men occasionally get boiled meal.

The dogs are not affectionate and need to be carefully watched. A man walking upright would not be attacked unless the dogs were at the extremity of hunger, but a fall in the snow, putting him at a disadvantage, might

ON A LONG JOURNEY

cause the animals to attack him. Those who have knowledge of the habits of these dogs state that they should always be kept within sight of the driver and within reach of a stout hide whip. The Eskimo dog has short legs, which make it appear smaller than it really is.

ESPAR'TO, a fiber grass extensively used in Europe in the manufacture of paper. It grows chiefly in Spain and Northern Africa, although small quantities are found in dry places in the United States from New England west to Wisconsin. The expense of cleaning it and the cost of transportation make its use impractical in America. This grass, when green, is also used in the manufacture of cordage, matting and similar articles. Cables of esparto grass are used in the Spanish navy, as they are light and will float on the water.

Esparto grass resembles feather-grass. It grows three or four feet high, in clusters from two to ten feet in circumference. The stems are hairy; the leaves are gray-green and they grow six inches to three feet in length.

ESPERANTO, *es per ahn' toh,* a language devised by Dr. Zamenhof of Warsaw, intended to serve as a world language. Under the assumed name of Dr. Esperanto, the originator of the language published his first pamphlet on the subject in 1887; from this the language takes its name. The alphabet consists of 28 letters, 5 vowels (vokaloj) and 23 consonants (konsonantoj):

A a, B b, C c, Ĉ ĉ, D d, E e, F f, G g, Ĝ ĝ, H h, Ĥ ĥ, I i, J j, Ĵ ĵ, K k, L l, M m, N n, O o, P p, R r, S s, Ŝ ŝ, T t, U u, Ŭ ŭ, V v, Z z.

The vocabulary is formed by using first the root words which are common to all the principal European languages; then those that are

common to all but one, then those that are common to all but two, etc. To show the manner in which words are formed in Esperanto Dr. Zamenhof gives, as an illustration, the word *fratino,* which in reality consists of three words, *frat, in, o. Frat* gives the idea of the offspring of one's parents; *in,* the idea of the female sex, and *o,* the idea of existence (person or thing), hence a noun. These three ideas combined in Esperanto make *fratino,* a *sister.* The first and last make *frato,* a *brother.*

The grammar is very simple. By means of a carefully-prepared system of prefixes and suffixes the vocabulary may be extended to an almost unlimited degree; thus *facile* means *easily; malfacile, with difficulty; dekstre, on the right, maldekstren, to the left.* A great many books and magazines have been published in Esperanto. The *English-Esperanto Gazette* was founded by Mr. H. Bolingbroke Mudie in November, 1903; this was followed in 1905 by *The British Esperantist,* which is the official organ of the British Esperanto Association. There is also an American Esperanto Association, and the Esperanto Society of India has been formed. Other languages competing with Esperanto for place as an international language are Volapük, Idiom, Neutral and Bolak, but none of these has made noticeable gains in a number of years. Unless there is a revival of interest in it, Esperanto and Volapük, its most notable competitor for favor, will fail of their purpose. See VOLAPÜK. M.R.T.

ESQUIMALT, *es'kwe malt,* a city in British Columbia, on Vancouver Island, three miles north of Victoria, with which it is connected by the British Columbia Electric and the Canadian Pacific railways. It is also on the Esquimalt & Nanaimo Railway. Esquimalt is best known as the only Canadian naval base on the Pacific coast; it has a graving dock and repair yards. It is also an important center for shipbuilding and salmon canning. Esquimalt was incorporated as a city on September 1, 1912. Population in 1916, about 4,000. G.H.P.

ESSAY, *es'a,* a literary composition on some special subject, usually shorter and less formal than a treatise, more loosely constructed than an oration, less argumentative than a thesis, and more limited in scope than a biography or history. "It does not pursue its theme like a pointer, but goes hither and thither like a bird to find material for its nest, or a bee to get honey for its comb," is one writer's characterization of it. According to their material, essays can be grouped as historical, political, critical, scientific or personal.

Of the latter type are the essays of Michel Montaigne, the French writer who developed this form of literature. Unlike the novel, the drama or the epic, the essay sprang into being without passing through a long process of evolution, for it came in finished form from Montaigne's pen. His essays are chatty, informal and rambling, and he used the conversational method freely. Informal and intimate, too, are the essays of Francis Bacon, the next great essayist after Montaigne. Bacon, however, put plenty of substance into his essays; he gave them solidity, and through them endeavored to advise and to impart information.

Essays constitute an important part of written English literature. Notable among these are the papers of Steele and Addison in the *Tatler* and the *Spectator;* Charles Lamb's *Essays of Elia;* Macalay's *Milton;* Carlyle's *Burns;* Matthew Arnold's *Sweetness and Light;* Ruskin's *Sesame and Lilies* (a collection of essays); and the essays of Huxley, Newman, Hazlitt, De Quincey, Robert Louis Stevenson and George E. Saintsbury.

Among American essayists, Emerson is the most eminent; probably his best-known essay is *Self-Reliance.* Others who have won honor in this field are Irving, Lowell, Holmes, Thoreau, George W. Curtis, William Dean Howells, Hamilton Wright Mabie, Samuel M. Crothers and Agnes Repplier.

The following essay, by Francis Bacon, is representative of the best work of that author, and is an example of what an essay should be:

Of Studies

Studies serve for delight, for ornament, and for ability. Their chief use for delight is in privateness and retiring; for ornament, is in discourse; and for ability, is in the judgment and disposition of business; for expert men can execute, and perhaps judge of particulars, one by one, but the general counsels, and the plots and marshaling of affairs, come best from those that are learned.

To spend too much time in studies, is sloth; to use them too much for ornament, is affectation; to make judgment wholly by their rules, is the humor of a scholar; they perfect nature, and are perfected by experience; for natural abilities are like natural plants, that need pruning by study, and studies themselves do give forth directions too much at large, except they be bounded in by experience. Crafty men contemn studies, simple men admire them, and wise men use them; for

they teach not their own use; but that is a wisdom without them, and above them, won by observation.

Read not to contradict and confute, nor to believe and take for granted, nor to find talk and discourse, but to weigh and consider. Some books are to be tasted, others to be swallowed, and some few to be chewed and digested; that is, some books are to be read only in parts; others to be read but not curiously; and some few to be read wholly, and with diligence and attention. Some books also may be read by deputy, and extracts made of them by others; but that would be only in the less important arguments and the meaner sort of books; else distilled books are, like common distilled waters, flashy things. Reading maketh a full man; conference a ready man; and writing an exact man; and, therefore, if a man write little, he had need have a great memory; if he confer little, he had need have a present wit; and if he read little, he had need have much cunning, to seem to know that he doth not.

Histories make men wise; poets, witty; the mathematics, subtile; natural philosophy, deep; moral, grave; logic and rhetoric, able to contend; nay, there is no stand or impediment in the wit, but may be wrought out by fit studies; like as diseases of the body may have appropriate exercises; bowling is good for the stone and reins, shooting for the lungs and breast, gentle walking for the stomach, riding for the head, and the like; so if a man's wit be wandering, let him study the mathematics; for in demonstrations if his wit be called away never so little, he must begin again; if his wit be not apt to distinguish or find differences, let him study the schoolmen; if he be not apt to beat over matters, and to call up one thing to prove and illustrate another, let him study the lawyers' cases; so every defect of the mind may have a special receipt.

ESSEN, *es'en,* the home of the great Krupp gun works, the greatest headquarters for the manufacture of war munitions in the world. The town is in Rhenish Prussia, Germany, northeast of Düsseldorf, in the midst of a rich coal and iron district. Essen grew from about 9,000 people, in 1849, to over 450,000 in 1915, the greater part of this increase being due to the development of the Krupp industries. Over 150,000 people are dependent upon the steel industry alone for a livelihood. In addition to cannon and military machinery of all kinds, the Krupps manufacture railway equipment, motor cars and other steel products.

The idea of an industrial community was conceived by Alfred Krupp in 1848. In its present numerous labor colonies, Essen represents a model industrial center where 30,000 persons are housed under ideal conditions and enjoy many social advantages given to few workmen in ordinary industrial communities. It is a national institution in private hands, and Bertha Krupp, daughter of the founder, now Bertha Krupp von Bohlen, who is at its head, is the richest woman in the world. The stock valuation of the company is over sixty million dollars. There are fifteen subsidiary companies, and at least five hundred branches in Germany and other parts of Europe. Although the industrial activity of Essen is recent, the town dates from the foundation of the Benedictine nunnery in 873. See KRUPP, FRIEDRICH ALFRED.

ESTATE, *es tate',* a legal term, used particularly in relation to land, indicating the nature of the right and the extent of interest which a person has in the land he possesses. This term arises from the fact that under the feudal system (which see) the ownership of all land was vested in the king, and all private holders of land were his tenants. The interest a tenant held in the land was called his *estate,* that is, his *status* in reference to it, and this was always less than absolute ownership.

The chief division of estates is into estates of freehold and estates not of freehold. There are three principal kinds of *freehold* estates: The *fee simple* constitutes an absolute ownership, without any restrictions whatever, the owner having the right to dispose of the land as he pleases. The *fee tail* is a freehold under which the owner can bequeath his estate only to some specified group of his descendants, as male heirs, for instance. In America this is practically unknown. The *life estate* gives the possessor an interest in the land or property during his life-time only. The estates which are not freeholds are various forms of tenancies, the difference usually being in the period over which the contract extends, whether for years, for life or from year to year.

ES'TEVAN, a town in Saskatchewan, founded in 1902 and named for Miss Esther Van Horne, daughter of Sir William C. Van Horne. Estevan is in the southeast part of the province, ten miles north of the international boundary, 145 miles southeast of Moose Jaw and 291 miles west of Winnipeg. It is on the Souris River, which is not navigable, and on the Soo line of the Canadian Pacific Railway, and is the terminus of the Estevan branch of the Canadian Northern Railway. It is the center of the lignite coal area of South Saskatchewan, and as the region grows the town will doubtless keep pace with it. Coal

mining and brick and tile making are the only industries of significance, but there are also a number of distributors of implements and other materials required in the neighborhood. The local Dominion building, completed in 1909, and the collegiate institute, erected in 1914 at a cost of $65,000, are noteworthy structures. The town owns and operates its water, sewer and electric light systems. It is the center of a judicial district. Population in 1911, 1,981; in 1916, 2,140. P.C.D.

ESTHER, *es'ter,* the central figure in one of the world's most beautiful stories, a comely Jewish maiden, who became the wife of the despotic Persian king, Ahasuerus, and saved all her nation from destruction. The tale is found in the book of *Esther* (see below). When Esther was left an orphan, her cousin Mordecai took her under his protection and trained her until the time when the king, who had divorced Vashti, sought a new queen; then she was chosen for the high honor. It was not known at the time that she was a Jewess, but later when Haman, who had become the royal favorite, sought to destroy all the Jews, she revealed her nationality to the king and pleaded so successfully for her people that the plotter Haman was hanged on the gallows he had prepared for the Jews.

The Book of Esther, the last of the historical books of the Old Testament, written about 425 B.C., gives the life of the beautiful queen whose name it bears. Its authorship is unknown, and some have opposed including it in the Bible, because the name of God does not appear in it. The great lesson in the book is the overruling power of Providence. The strongest argument for the fact that the story of Esther is true lies in the feast of Purim, which is still observed by the Jews to celebrate the saving of the nation from destruction at the time of Esther.

ESTHETICS, *es thet'iks,* from a Greek word meaning *perceptive,* was applied by the German philosopher Hegel, early in the nineteenth century, to a science of fine arts which he had worked out. Since his time the term has been in general use to designate the philosophy of the beautiful in nature or in art. Though the ancient Greeks did not think of esthetics as a separate branch of learning, this philosophy began with their early speculations on the nature of beauty. Socrates taught that beauty and usefulness were one and the same thing, and that art was simply an imitation of nature.

ESTHONIA, one of the Baltic provinces, bordering on the Gulf of Finland, with Livonia on the south. In 1346 it was purchased from Denmark by Germany; in 1561 it was won in war by Sweden, which ceded it to Russia in 1721. By the treaty of peace, in January, 1918, between Germany and Russia's bolsheviki government, it returned to German ownership. Including Dago and other Baltic islands, the area of Esthonia is 7,820 square miles; the population, 471,400. Ninety per cent of the people are native Esthonians, who call themselves Esths. They resemble the Finns racially.

ETCH'ING, a process of engraving metal plates by means of an acid. In ordinary line-engraving (see ENGRAVING) the lines of the design are literally ploughed into the plate by force. In etching, on the contrary, the design is lightly drawn or scratched on the surface of the plate, and is then deepened to the desired degree by the use of acids.

The word *etching* is a form of the Dutch word *essen,* which means *to eat,* for in etching the acid eats away the copper. The plate is first cleaned thoroughly, and is then covered with an *etching ground.* This ground may be made in several ways, but is usually a composition of wax, gum-arabic and bitumen. When applied evenly to the surface of the plate, this ground protects it from the action of the acid, except at those points at which the etcher's needle has cut through it.

The design or drawing may be traced, or it may be drawn directly on the plate; in the latter case it is usually called a *painter etching,* because the etcher is drawing on his plate as the painter does on his canvas. To draw the design in the wax most etchers use needles of varying sizes, but any sharp instrument will do, and Turner, the great painter, engraver and etcher, actually used the prong of an old steel fork. The needle scrapes away the etching ground and leaves a bare copper surface, into which the acid *bites.*

The biting was formerly done with nitrous acid, but a mixture of hydrochloric acid and chlorate of potash is now more commonly used. To get lines of different depth and heaviness it is necessary to give the plate several baths in the acid. Any lines which are already deep enough can be *stopped out,* that is, covered with a varnish or etching ground which keeps out the acid while the remaining lines are being deepened.

As explained in the article ENGRAVING, etching has long been recognized as a legitimate

field for great artists. Many of the greatest painters have done original etching, or have reproduced their own works. Rembrandt is generally regarded as the father of etching, and in the estimation of most artists he is the greatest etcher who has ever lived. Ostade, Ruysdael, Paul Potter and Van Dyck are only a few of the many other Dutch painters who were also great etchers. Of modern etchers who stand in the first rank the world recognizes Sir Seymour Haden, Whistler, Bracquemond, Méryon, Anders Zorn, David Y. Cameron, Frank Brangwyn and Joseph Pennell. W.F.Z.

ETH'ELRED II (?968-1016), an English king known as THE UNREADY because of his inability to accept *rede,* or counsel. He spent most of his reign repelling the repeated attacks of the Danes, relying more on money payments than on arms. In 1002 he ordered the murder of every Dane in England, and from then on the hostility of Sweyn, king of Denmark, was almost unceasing. In 1013 Ethelred was obliged to flee to Normandy, the home of his wife, Emma. The next year, upon the death of Sweyn, he was recalled to his former kingdom. He died in London while preparing to resist another Danish invasion led by Canute, son of Sweyn. One of Ethelred's sons was Edward the Confessor.

ETHELWULF, *eth'el woolf* (? -858), the father of Alfred the Great. During the lifetime of his father, Egbert, he was king of Kent, Essex and Sussex, but in 839 he inherited the crown of Wessex and gave the subordinate dominions to his son Ethelstan. To repel the repeated ravages of the Danes he appointed officers to organize each of the maritime districts, but during his reign the invaders twice reached London. In 856, on his return from a pilgrimage to Rome, Ethelwulf found that his son Ethelbald had usurped his throne. Instead of inspiring a civil war, Ethelwulf resigned his rule over Wessex and took, instead, the kingdom which he had first governed.

E'THER. We are all familiar with the incandescent electric lamp, which consists of a carbon filament contained in a glass bulb from which the air has been removed. We know that such a lamp also radiates heat, so there must be some substance present in which heat waves can travel. We also know that we receive light and heat from the sun, although with the exception of the thin envelope of air the space between the earth and the sun seems to be absolutely empty. Light and heat are forms of energy, and we cannot conceive that energy can be transferred from one place to another unless it is transmitted by or through some medium. Scientists have therefore assumed that the seemingly empty spaces in the universe are filled with a substance through which energy can travel. This substance or medium has been named *ether.*

Men of science have devoted much time and research to the study of ether, but up to the present we know very little about the nature of this substance or of its properties. This is not surprising, for this study is connected with the most delicate and abstract problems in physics, such as the constitution of matter, the wonderful power known as electricity, and other fascinating subjects which the mind of man in its desire to discover the secrets of nature is constantly pursuing. For the present let us be satisfied to know that ether is the substance that fills the immeasurable spaces of the universe which separate the heavenly bodies and that it permeates even the smallest particles into which matter can be divided.

ETHER, a colorless, sweet-smelling liquid, whose fumes produce insensibility so complete that under its influence major surgical operations are performed (see ANESTHETIC). An American dentist, William Thomas Green Morton, was the first to use it regularly as an anesthetic. After applying ether in a number of minor operations and in many experiments on animals, he made its value known to the public in 1846.

The chemical name of ether is ethyl-ether. Ether is obtained as the result of the action of sulphuric acid upon alcohol. It is sometimes used as a local anesthetic, producing intense cold when evaporated; if injected under the skin it acts rapidly as a stimulant on the heart and respiration, and is valuable in cases of fainting. Ether is considered a safer anesthetic than chloroform, and is used extensively in surgery. It is liable, however, to have an irritating effect on the kidneys, and to stimulate bronchial trouble; otherwise, its administration is not attended with danger, unless the patient has a weak heart.

Disagreeable after-effects, especially severe nausea, have long been associated with the use of ether as an anesthetic. Various remedies for counteracting this nausea are now being employed. European physicians favor injecting into the veins or muscles the anesthetic diluted with a saline solution. An expedient introduced recently into America consists in the injection of ether mixed with olive oil into

the lower bowel. If the anesthetic is freed from all impurities before it is administered the patient is much less liable to suffer from nausea on regaining consciousness. Since the middle of the nineteenth century ether has been used to some extent in Ireland as an intoxicant. The effects are similar to those attending the use of opium.

ETHICS, *eth'iks.* Questions of right and wrong are woven into all conversation; they are as close to our life as the air we breathe. Should I buy this expensive coat? Is it right for Harry to go with the boys with whom he associates? Should Mary stay out of school to work? Each of these questions includes the problem of right and wrong. Questions of this nature are constantly confronting us in the home, in the school, in society and in the world of business. How may we find the right answer to them? What should constitute the underlying principles by which the moral problems of our lives and of society are solved?

So important are such questions held to be that a complete "science of right and wrong" has grown up, which has for its purpose the solving of them, and this science is called *ethics,* the name being derived from a Greek word meaning *character.* The student of ethics must not expect, however, that his specific moral problems will be solved by a study of this science. Ethics endeavors to answer such questions along general lines, but it does not, and cannot, answer specifically each question, for two reasons:

1. "Because each life, and so the right choice in any life, is different from any that has been made before."

2. "Because of the wide difference in opinion it is impossible to tell offhand what morality should be. We can, however, tell what morality has been and is. We can assert, for instance, without fear of contradiction, that murder, lying and theft are wrong, and that kindness, truthfulness and honesty are right."

Everyday Phases. As a science, ethics finds no place in the list of studies until college days are reached; but long before school days begin every child must have been made acquainted with many of the most important ethical principles. The instructor or the mother who teaches a child to be habitually courteous, unselfish, kindly and self-controlled is giving instruction in just those fundamentals which scholars and philosophers have laid down as the basis of ethical conduct. That such training is the most important part of her work, every mother and teacher recognizes.

The teachers and mothers recognize, too, that for such moral instruction no hard and fast rules can be laid down. Age, disposition, circumstance—all these determine in large measure the course it shall take; but the following suggestions will be found helpful by anyone who has to deal with children.

1. The child is a creature of impulse and often needs help in gaining that self-control necessary to a stable character. "I didn't think," or "I did it before I thought," is his frequent excuse when his acts are called in question. At this stage he needs guidance rather than censure.

2. Use every right effort to fix in the minds of children high ideals and right principles of living, so when they leave home and school they may be able to withstand the temptations that confront them.

3. The higher emotions will displace the lower —love will drive out fear, and sympathy will allay angry passions; therefore cultivate the higher emotions.

4. Moral training to be effective must be positive, not negative. Lead children to see and choose the right. Give them opportunity to discuss questions of a moral nature whenever they are in doubt about them.

5. See that children are provided with wholesome recreation, and such work as they have the capacity to do. Not only an "idle brain," but idle hands, as well, are the "devil's workshop."

6. Let the atmosphere of the home and the school be such as to strengthen all right impulses and higher emotions.

7. It is by the choices and acts of everyday life that character is formed, more than by great crises. Through his daily tasks and decisions the youth fortifies himself to withstand the crisis when it comes.

8. Make use of stories and the great characters of literature as incentives to a noble character. The myth and the fairy tale when wisely chosen leave the child with the desire to emulate the good and beautiful character that dominates the story. Such characters as Gluck in *The King of the Golden River,* Ernest in *The Great Stone Face,* Ellen in Scott's *Lady of the Lake* and many others that might be named exert a powerful influence on boys and girls in the "'teen" age.

9. Train for active life; strength of character is seldom developed in seclusion. The Great Teacher prayed, not that His disciples might be taken out of the world, but that they might be kept from the evils of the world, that they might discharge their duties in mingling with men, and at the same time be unscathed by the temptations and evils with which they were surrounded.

"A talent may be developed in solitude, but character only in the rush of the world."

Consult Larned's *A Primer of Right and Wrong;* Cabot's *Every-day Ethics;* Rickaby's *Moral Philosophy, or Ethics and Natural Law;* Royce's *The Philosophy of Loyalty.*

Related Subjects. The following articles in these volumes contain material which is more or

less closely related to the general subject of ethics:

Baby	Judgment
Child	Personal Liberty
Child Study	Psychology
Education	Reason
Feeling	Sociology
Free Will	Theology
Habit	Will

ETHIOPIA, *e thi o'pi a,* in ancient times a vaguely defined country south of Egypt, including present-day Nubia and perhaps Abyssinia and Kordofan. The name itself, derived from two Greek words meaning *sunburnt faces,* is

ANCIENT ETHIOPIA

Its northern boundary is believed to have been close to the dotted line in the map, south of the first cataract.

evidently an allusion to the dark skins of the natives. Whether the Egyptians civilized the Ethiopians or whether they themselves owed their ancient culture to the Ethiopians has long been a subject of dispute, but excavations now in progress will probably answer all such questions. The two countries were closely connected, geographically, socially and commercially. About 1600 B.C. Ethiopia became an Egyptian province, but eight centuries later the condition was reversed, and Ethiopian kings ruled Egypt until about 660 B.C. In 524 Cambyses, king of Persia, invaded the country and captured Napata, the capital. Later the seat of the kingdom was at Meroë, farther south. Northern Ethiopia was part of the Roman Empire, but Meroë maintained its independence until the rise of the Christian state of Nubia, in the sixth century A.D. See ABYSSINIA.

ETHNOGRAPHY, *eth nog'ra fi,* the science that describes the various races, tribes and nations of men. Ethnography is a branch of anthropology, which treats of mankind as a whole, its origin and its development, in language, art, religion and political ideas, from barbarism to civilization. Ethnography deals chiefly with the assembling of facts regarding the families, tribes and races of mankind, and seeks to explain the significance of the information secured. The ancients were interested to some extent in the study of foreign races, but not until the discovery of America did the civilized peoples make systematic efforts to study other races. The great governments of the world have now established bureaus for the purpose of investigating their own primitive races and the different peoples that come under their rule, and also the tribes and clans of other nations. See ANTHROPOLOGY; ETHNOLOGY.

ETHNOLOGY, *eth nol' o ji,* the branch of anthropology which seeks out the conditions which produce the customs, laws and habits of nations, the influence they exert on the destiny of commonwealths and the principles of life which they illustrate. Ethnology explains the social life, physical conditions and stage of culture of the various tribes of men, with the aim of defining, by a comparison of such facts, the universal laws of progress of the human species. It explains how language, the arts, food supply, laws and religion exercise their influence on men and on nations. Ethnology and ethnography occupy a relation to each other somewhat like that of geology and geography; ethnography deals with existing facts, while ethnology attempts to investigate the factors which produced them. Thus, the Bureau of American Ethnology at Washington studies the past of the American Indian. See ETHNOGRAPHY; ANTHROPOLOGY.

ETIOLATION, *e ti o la'shun.* Certain vegetables, such as celery, asparagus, cauliflower, endive and chicory, are more tender and desirable for the table when whitened than when bearing their natural green. By banking dirt about the stalks of celery, or by pulling the leaves of cauliflowers over the heads, market gardeners shut the sunlight from vegetables and so prevent the formation of the green coloring matter called *chlorophyll.* As a result the cell walls do not grow as thick as usual.

This blanching of vegetables is but one form of *etiolation* (which is the French word for blanching). Etiolation should be carefully prevented in the growing of grains. If grains are sown too thickly the bases of the stems will be shaded so much that blanching will naturally result, and the cells there will not be

strong enough to bear the weight of the grain heads when winds blow. See CHLOROPHYLL.

ETIQUETTE, *et'iket,* a word of French origin, originally applied to the ticket or label attached to bags and bundles for the purpose of identifying their contents; in its present usage it signifies those niceties of behavior that stamp or label one as understanding the requirements of correct deportment.

Society has worked out for itself rules of behavior for all phases of human activity—social and business intercourse, dining, dressing, corresponding, etc. The well-bred person is the one who understands these requirements and who puts them into practice with naturalness, grace and ease. Good manners are of course indispensable in society, and they have a very practical value in business life. Whether one is beginning a business career or is well established in some vocation, good breeding is a most helpful equipment. Ignorance of the requirements of good form has often caused a young man's sterling qualities to be overlooked.

Etiquette, however, is more than the formal observance of social customs. It is founded on kindliness and consideration for others and true courtesy of the heart, qualities that James T. Fields describes in these words:

How sweet and gracious, even in common speech,
Is that fine sense which men call Courtesy!
Wholesome as air and genial as the light,
Welcome in every clime as breath of flowers—
It transmutes aliens into trusting friends,
And gives its owner passport round the globe.

Washington's Rules of Civility. There is preserved in the state archives at Washington, D. C., in the handwriting of George Washington, an interesting manuscript book containing, among other exercises, a list of rules of behavior. The book bears the date 1745, showing that the compiler wrote the rules when he was a lad of fifteen. What the later Father of His Country considered to be "decent behavior in company and conversation," to use his own words, is suggested by the following extracts:

Every action done in company ought to be with some sign of respect to those that are present.

In the presence of others sing not to yourself with a humming noise or drum with your fingers or feet.

When you sit down, keep your feet firm and even, without putting one on the other or crossing them.

Undertake not to teach your equal in the art himself professes; it flavors of arrogancy.

Give not advice without being asked and when desired do it briefly.

It is unbecoming to stoop much to one's meat. Keep your fingers clean and when foul wipe them on the corner of your table napkin.

Labor to keep alive in your breast that little spark of celestial fire called conscience.

ET'NA, also spelled **AETNA,** is one of the most celebrated volcanoes in the world, and is situated in Sicily. No other mountain has excited the wonder, admiration, dread and superstitious awe that Etna has inspired. Its

LOCATION OF MOUNT ETNA

summit is nearly 11,000 feet above the sea, and its base, with a circumference of over 100 miles, is washed by the waves of the Mediterranean Sea. Its top is crowned with perpetual snow, its vast slopes covered with forests; and spreading orchards, vineyards and orange groves at its base form a picture of rare beauty. There are two cities, Catania and Acireale, and sixty-three towns or villages on Mount Etna, and the region is the most densely-populated of any part of Sicily. The first recorded eruption of Etna occurred in the eighth century B. C. Of about eighty eruptions since then, many have been of extreme violence. In 1669 there was an earthquake during the eruption, when over 20,000 lives were lost. A remarkable feature of Etna is the large number of minor cones, all of volcanic origin, that are scattered over its sides. Recent eruptions were those of 1874, 1886 and 1911. The last-named was more violent than any other for over a hundred years; a lava stream nearly half a mile wide flowed into the valley below.

In legend, Etna was the mass of rock which Zeus heaved upon the giant Typhon; it was also the workshop of Vulcan and the Cyclopes.

E'TON COLLEGE, the most famous of all English public schools, now attended largely by the sons of royalty and of the nobility. It was founded in 1440 by Henry VI, under the name of the "King's College of Our Lady of Eton beside Windsor," and was originally endowed from revenues confiscated from priories by Henry V. The increase in value of property and further endowments have made the college one of the richest educational institutions in the world. The object of the college when established was to educate twenty-five boys, sons of indigent parents, and to support an equal number of poor men. In 1443 it was decided that tuition pupils should be admitted. These were at first called commoners, but are now known as "oppidans," and because of the expense only sons of wealthy parents are now among the student body. Tuition fees range from $800 to $1,000 per year.

Many of England's most famous statesmen and soldiers received their early education at Eton. The Duke of Wellington, a distinguished Etonian, said that the battles of England were won on the football fields of Eton and other English schools, where athletics are considered of the greatest importance in building strong men, bodily and mentally.

ETRURIA, *e tru'ri a,* in ancient geography, a division of Italy, north and west of the Tiber and west of the Apennine Mountains, and including the valley of the Arno. Modern Tuscany and the northern half of the province

ANCIENT ETRURIA

of Rome cover about the same territory. Etruria proper contained a confederation of twelve cities, each of which was independent. The people of Etruria, called *Etruscans,* were the most advanced of any in Italy before the rise of Rome. They had magnificent cities and a highly-developed political organization. At the height of their power, about 500 B.C., they controlled Corsica and were the allies of Carthage. The Tarquins (see TARQUINIUS, LUCIUS), legendary tyrants of Rome, were probably Etruscans, and with their expulsion began a struggle between Etruria and Rome which lasted until the former became virtually tributary to the latter in 309 B.C. See ETRUSCAN ART.

ETRUSCAN, *e trus'kan,* **ART.** The art of the people of ancient Etruria (which see), embraced vases done in clay and terra cotta, casting and chiseling in bronze and stone and exquisite pieces of jewelry, gems and coins. From these (except the vases, which are Greek), as well as from the mural paintings found in their tombs and from their work on sarcophagi and cinerary urns, is learned the life, customs, religious creed, costumes, etc., of the Etruscans. The gems consisted usually of carnelian or banded agate, cut in the form of beetles and having a flat face on which a design was engraved. Etruscan jewelry consisted of two kinds—domestic and sepulchral. Of the latter many fine specimens remain, especially the wreaths of gold leaves which encircled the helmets of their warriors.

Etruria! beneath thy magic hands
Glides the quick wheel, the plastic clay expands.
Nerved with fine touch, thy fingers, as it turns,
Mark the nice bounds of vases, ewers, and urns.
—*Darwin.*

ETYMOLOGY, *et i mol'o ji.* Words are always living, growing, changing. They have individualities and personal histories, just as human beings have, and one of the most fascinating of all the sciences is that which traces words back to their earliest sources and follows their changes in form and meaning through the centuries. Such study of the origin and history of words is called *etymology,* a name coming from two Greek words meaning *true account.*

The Purposes of Etymology. In this very derivation of the word we have an illustration of simple etymology, making us better able to understand the term and to use it correctly. These are the chief reasons for learning a word's etymology, although the one who is a specialist in philology can use his knowledge in establishing relationships among the different races of the earth (see PHILOLOGY). Everyone interested in building up a large and accurate vocabulary should use a dictionary that not only gives the meaning and pronunciation of

words but their derivation as well, and should get into the habit of noticing the elements of which they are built. By following this plan, word-study soon becomes as delightful and absorbing as a game.

Three Interesting Word Histories. A boy dressing for his gymnasium class may wonder what the word *gymnasium* really means. If he consults a complete dictionary, he will learn that it comes from a Greek root meaning *naked;* and if he has studied a little about Greek life and customs he will recall that the boys and young men of Greece wore no clothing when they took part in athletic games and exercises. A girl attending church or Sunday-school finds her attention caught by the quaint-looking word *gospel,* and begins to wonder as to its origin. If when she reaches home she remembers to get out the big dictionary, she will be able to trace the word back to the old Saxon compound *god-spell,* meaning *God-story,* and forever afterward it will be invested with deeper significance and interest for her. Another word with a life story is *tribulation,* which comes from the Latin *tribulum,* the name given to the iron-studded flail the Romans used for threshing grain. With this etymology in mind, our English word suggests the picture of a person suffering the pains of one who is being beaten with a flail.

There are thousands upon thousands of words in English which have just such interesting histories—fascinating little stories which are indicated briefly in every unabridged dictionary.

Etymology and History. "The study of words," says Professor Kittredge of Harvard, "is the study of the history of civilization." The study of English words goes hand in hand with the study of English history, showing how the language has changed with the successive invasions of the Romans, Saxons, Danes and Normans. To illustrate: the Latin word for a fortified camp is *castra.* During the five centuries the Romans ruled over England this word was added to Celtic roots to designate the different camps, which gradually grew into towns, giving us such names as Lancaster (land-castra) and Manchester (man-castra). The Danish affix for *town* was *by,* and names like Whitby and Derby testify to the effect Danish had upon the Saxon language which, by crowding out the ancient Celtic, had become the speech of all England.

The Long Road Words Travel. English word-study will take us even beyond the beginnings of English history, as such—back to ancient civilizations whose languages show kinship with the English tongue. For students of etymology have been able to show that the Sanskrit, Persian, Greek, Latin, Celtic, Slavonic and Teutonic groups of languages have points of resemblance that prove they developed from a common source. Our word *mother,* for example, has such close relatives as the Anglo-Saxon *mōder,* German *Mutter,* Icelandic *modhir,* Swedish and Danish *moder,* Gaelic *mathair,* Latin *mater,* Italian and Spanish *madre,* French *mère,* Lithuanian *mote,* Polish *matka,* Persian *mader,* Sanskrit *mata,* and many others among the different languages of the earth.

Some Peculiar Changes in Meaning. Since etymology in its widest sense follows a word through all the different shades of form and meaning it has assumed as it has traveled down the ages, it reveals many words whose original significance was utterly different from their present meaning. A most interesting example is the word *depart,* which once meant *divide* or *separate,* so that the old English marriage service read "till death us depart." A *jig* was a fiddle to whose music the country-folk danced. *Imp* originally meant simply *child,* and prayers offered for the health of the Prince of Wales used to refer to him as "that most angelic imp." *Wretch* was a term of affection, a *miser* was a person in misery, and an *idiot* simply a private individual not taking part in public life.

Thus we see that, instead of being a dry, dull subject, etymology is as full of charm and interest as a book of tales. Once a student gets accustomed to looking up the true derivation of the words he meets, he has "the dictionary habit" in its best form and finds new interest and profit in every page he reads. See DICTIONARY. L.M.B.

Consult Bradley's *The Making of English;* Skeat's *The Science of Etymology.*

EUBOEA, *u be'a,* the largest of the Grecian islands in the Aegean Sea, 100 miles in length and in one place about thirty-three in width. It is mountainous in character, but has fertile valleys which produce olive oil, wheat, fruit and honey. The chief towns are Chalcis and Carystus. The inhabitants of Euboea have engaged in cattle-breeding since prehistoric times, the very name meaning *rich in cattle.* The history of the island includes its early occupation by the Abantes and Ionians, its subjugation by Athens after the Persian Wars

and its conquest in 1470 by the Turks, in whose possession it remained until the Greek revolution. In 1830 it was made a department of the new Greek kingdom. It was an ancient intellectual center, and for a long time was the home of Aristotle.

EUCALYPTUS, *u ka lip' tus,* a tree of great commercial and ornamental value. It is a native of Australia and other warm climates, but as it grows rapidly and can be put to many uses, one variety, the *blue gum,* has been cultivated in California, Arizona and Florida. Four to six years after planting it can be cut for fuel; after twenty to thirty years it is fit for saw timber. It has been found that eucalyptus will thrive well where the temperature does not fall below 22° F. for long periods. The trees are remarkable for their gigantic size, some reaching the height of 450 or 500 feet, or nearly the height of the Washington Monument. The leaves are long, narrow, leathery and unsymmetrical, so placed on the stem as to present an edge towards the sun as protection against the heat. The flowers are white, bell-shaped and filled with nectar.

THE EUCALYPTUS

Branch, with leaves, flower and fruit. The picture at the right shows the usual appearance of the tree.

Uses. Eucalyptus trees absorb a great deal of moisture and have been found valuable for planting in malarial districts; they therefore prevent to some extent the development of mosquitoes. As lumber for shipbuilding, railroad ties, paving blocks and for telegraph poles and piers, the eucalyptus is unexcelled. Due to the large amount of astringent resin in eucalyptus wood, it resists attacks of shipworm and other borers, and so is especially adapted for use under water. In California it has brought as high as $100 to $125 per thousand feet. As fuel it brings from $3 to $5 a cord on the stump. The bark of some species furnishes tannin; that of the "stringy bark eucalyptus" produces fibers for cordage, paper and building-thatch.

Eucalyptus leaves are valued for the oil they contain, which has a camphorlike odor and is used as an antiseptic and a stimulant, for dressing wounds and for diseases of the lungs and throat. At the University of Melbourne, Australia, Dr. Richard Bull discovered that eucalyptus oil is a positive destroyer of the germ of cerebrospinal meningitis, a disease long thought incurable (see MENINGITIS). M.S.

Consult *Arizona Experiment Station Bulletin 60; California Experiment Station Bulletin 196;* United States Department of Agriculture *Bulletins 35* and *87.* The former may be secured by addressing the Stations in the states named; the latter may be secured from the Forest Service Bureau of the Department of Agriculture, Washington.

EUCHRE, *u'ker,* a card game probably of German origin, played by two or more persons, with a pack of ordinary playing cards, with or without the joker. All cards between the aces and sevens are taken out, and sometimes the sevens and eights are also discarded. The players cut for deal, and the one deals who draws the lowest card. If four are playing the two opposite players become partners. The dealer gives five cards to each player, at first three and then two. He turns up the top card of those remaining as trump card. If a jack turns up it counts one to the dealer.

The knave of the suit turned up is called the *right bower,* and becomes the highest in the pack except the joker. The next highest card is the other knave of the same color, called the *left bower.* Other cards count in the usual order, aces being higher than kings. The player next the dealer has the option of ordering the dealer to discard one card and take up the trump card or of *passing.* If he *orders up* he must take three tricks or be *euchred* and give two points to his opponents. If all pass, the dealer either accepts the trump or turns it down; in the latter case the next player has the option of declaring trumps from some other suit in his hand. If a player has a strong hand he may play alone, without any assistance from his partner, who discards his hand. If the lone player scores all five tricks (a *march*), he counts four; for three tricks he counts two; if he wins less than three he is *euchred.* If the maker of the trump does not choose to play alone the count is two for five tricks taken,

or one for three tricks. The object is, with or without help from the partner, to score at least three out of five tricks. A game is ten points, unless some other arrangement is made. A player must always follow suit when he can.

Consult *Hoyle's Games.*

EUCHARIST, *u'ker ist,* a Greek word meaning *thankfulness* or *thanksgiving,* and used in the Christian Church to refer to the sacrament instituted by Christ at the Last Supper with His disciples. At that time, when partaking of bread and wine, He said, "This is my body. This is my blood." In Protestant churches it is generally referred to as the *Lord's Supper,* in the Roman Catholic as the *Blessed Sacrament.* Protestant rituals include a frequent observance of the sacrament. All Roman Catholics who have attained use of reason must receive Communion during Pascal season; but weekly, even daily, Communion is common. G.W.M.

EUCLID, *u'klid,* OF ALEXANDRIA, a Greek whose text-book on elementary geometry, written twenty-two centuries ago, is still in use in schools. In England, in parts of Canada and in some other countries boys and girls do not say, "I must study my geometry," as in the United States, but, "I must study my Euclid." The *Elements* of the famous geometrician consisted of thirteen books, or perhaps of fifteen, but as a rule only six books are studied.

Of Euclid's life little is known. Most of our information is gained from the commentary by Proclus written seven centuries later than the *Elements.* Proclus says that Euclid lived in the time of Ptolemy I, who reigned from 323 to 285 B.C. He tells that when the king asked if there were not an easier way to learn geometry than by the study of the *Elements,* Euclid answered, "There is no other royal road to geometry."

EUGENE, *u jeen',* ORE., the county seat of Lane County, a city in the west-central part of the state, situated on the Willamette River at the head of navigation. Its supporting industries are lumbering and agriculture. Portland is 123 miles north. Eugene is on the main line of the Southern Pacific, from San Francisco to Portland, is the terminus of the new branch to Coos Bay on the Pacific coast, and is served by two electric lines. The population in 1910 was 9,009; in 1916 it was estimated to be 13,572.

Eugene is situated in a natural amphitheater, partially surrounded by low hills of the Cascade Range, whose white peaks are visible in the distance. It is the land of the Douglas fir, and according to government figures there are in Lane County, which is approximately the size of the state of Connecticut, sixty billion board feet of America's greatest all-utility wood. Eugene is the commercial center for the industries of fruit raising, diversified farming and mining (gold and silver), carried on in the upper part of the fertile Willamette valley. The industrial enterprises of the city are canneries; flouring, woolen, saw and planing mills; sash, door, furniture and excelsior factories; iron works; machine shops; tanneries; and brickyards.

The University of Oregon (which see), attended by about 1,500 students, and the Eugene Bible College are located here. In addition to the buildings of these institutions there are a Federal building (occupied by offices of the Forest Service and by the post office), a Carnegie Library and two hospitals. The parks of the city are spots of natural, rugged beauty.

Eugene was settled in 1854 and incorporated in 1864. The city is governed under a charter of 1893.

EUGÈNE, *u jeen',* FRANÇOIS (1663-1736), called PRINCE EUGÈNE OF SAVOY, was an Austrian general who shared with the Duke of Marlborough the honors of the War of the Spanish Succession (see SUCCESSION WARS). Prince Eugène was one of the greatest military leaders of modern times. He was a Frenchman by birth, but early in his career renounced his allegiance to King Louis XIV because the latter had refused him a commission, and he joined the Austrian army. At the outbreak of the War of the Spanish Succession he invaded Italy and routed the French at the battles of Chiari and Luzzara. Later he joined Marlborough in Germany, and their united forces won the Battle of Blenheim, the "famous victory" of Southey's poem. By his victory at Turin in 1706 Eugène drove the French from Italy. With Marlborough he won the battles of Oudenarde and Lille in 1708, and that of Malplaquet in 1709. In a later war against the Turks he was equally conspicuous. The last years of his life were devoted to art and literature.

EUGENICS, *u jen'iks.* There are various sciences which devote themselves to unusual subjects—sciences which make a study of shells, of word-endings or of the fossil leaf-forms found in the rocks; but surely the most curious of all is the "science of being well born." This nearly new science is called

eugenics, from a Greek word meaning *good birth.* Most sciences concern themselves not with what ought to be, but with what is; but eugenics combines the two ideas. It declares that every child has a right to be well-born—to enter life without unnecessary handicaps; and it sets itself so far as possible to bring this to pass.

First of all, there are certain definite laws of heredity which are used as a basis. Stock-breeders and plant-breeders have long taken advantage of these to produce better and better plants and animals. By allowing only the most perfect specimens to reproduce, they do away with certain weaknesses and strengthen the good points; for it is a well-established fact that every living thing, whether plant or animal, receives its every characteristic from its ancestors, the most from those closest to it in point of time, the rest in ever-lessening degree from those further back. Everybody knows of the wonderful effects Luther Burbank has achieved in the plant world by making use of these principles (see BURBANK, LUTHER).

Now, scientists know that just as wonderful results could be achieved with human beings, if it were possible to control their lives in somewhat the same way. If none but strong, well-grown, intelligent men and strong, beautiful, intelligent women were allowed to mate and have families, within a few generations there would be practically no weaklings, whether in mind or in body. But, after all, there is a difference in dealing with human beings and with plants or animals; all human beings insist on mating from choice and not because any body of scientific men, no matter how good judges they may be, have chosen suitable mates for them. Even the most enthusiastic advocates of eugenics realize, therefore, that the science can never come to exercise any official control; but by the spread of the doctrines, which are not theories, but certainties, they hope to achieve much for future generations.

The legislature of the state of Wisconsin in 1913 passed a stringent law requiring a physical examination of the male applicant for a marriage license. This law was upheld by a decision of the supreme court of the state. Oregon and Pennsylvania have enacted similar laws, though less stringent as to the physical tests to be passed. Various other states have laws forbidding the marriage of insane, epileptic, feeble-minded and others physically or morally unfit for marriage. A beneficial result of the agitation and discussion aroused by the passage of such laws is that many people have come to see for themselves the necessity for such precautions. It is only in the United States, however, that drastic legislation like that of the state of Wisconsin has made any headway.

In one way, eugenics to-day has more to contend against than it would have had in times past. The ancient Spartans, for instance, allowed all the weak, imperfectly-formed babies to die, and thus built up a race which physically was almost perfect (see SPARTA). But the charitable attitude of modern times toward such weaklings demands that they shall receive more care and attention than the stronger children, and thus they often grow up to marry and have children who are even more defective than themselves. On the other hand, the frequent wars of antiquity killed off many of the finest physical specimens and thus helped to produce a smaller, feebler race. A war which causes many deaths is certain to have that effect; and if, in the minds of the skeptical, eugenics should need any proofs of its principles, these will without doubt be found in plenty in population conditions in Europe during the generations following the destructive War of the Nations.

It may well be pointed out that a distinction is made between *negative* eugenics and *positive* eugenics, the former seeking to prevent the multiplication of the unfit, the latter to encourage the multiplication of the fit. Negative eugenics calls for a considerable use of law. The unfit are often beyond the reach of a sense of responsibility for their offspring, and hence they can be controlled only by such policies as segregation, sterilization, etc. On the other hand, there is little room for law in encouraging superior persons to marry early and have normal families. With such, the motive will be the appeal of eugenics as an ideal of life. For positive results, therefore, the hope is in diffusing among the finer members of the race a sense of their obligation to transmit their inheritance and a pride in becoming parents of healthy, beautiful and intelligent children. E.A.R.

For a more extended study of the subject the reader is referred to Davenport's *Heredity in Relation to Eugenics;* Guyer's *Being Well Born; Eugenics Record Office Memoirs* (Cold Spring Harbor, N. Y.); Jewett's *The Next Generation.* An extensive bibliography entitled *Eugenics and Social Welfare* has been published by the New York State Board of Charities.

Related Subjects. The reader interested in eugenics will find further material of interest in the following articles in these volumes:

Baby	Environment
Breeding	Galton, Francis
Child	Heredity

EUGÉNIE-MARIE DE MONTIJO, *uh zha nee' mah ree' de mon tee'ho* (1826-), widow of Napoleon III, was born at Granada, Spain, and is of Spanish and Scotch extraction. In 1853, as wife of Napoleon III and empress of the French, she inaugurated in Paris a reign of frivolity and extravagance. Clever and fascinating, her influence over the emperor contributed to his downfall and was responsible for many of his political mistakes. Among these were the unfortunate Mexican expedition of Maximilian, which resulted in his death, the failure of the plans for the freedom of Italy, and, as a supreme catastrophe, the disastrous war with Prussia (see FRANCO-GERMAN WAR). Then followed the fall of the Empire, the flight of the empress from Paris, the death of Napoleon, and, as the crowning tragedy of Eugenie's life, the loss of her son, the Prince Imperial, who was slain in the Zulu War in 1879. Since 1870 Eugenie has resided mainly in England. See NAPOLEON III.

EULENSPIEGEL, *oi'len shpe'g'l,* TILL, a German wit, supposed to have lived in the first half of the fourteenth century, about whose name center numerous stories of wild, whimsical frolics and clownish pranks. These are all of an extremely coarse and brutal nature. An account of his antics was written in 1483 in Low Saxon and printed in High German thirty-six years later. This has been translated into Czech, Polish, Danish, French, Latin and English, the latter version appearing under the title *Howle-Glass.* The merry pranks of Till Eulenspiegel are the theme of a well-known orchestral symphony by Richard Strauss.

EUPHRATES, the largest river of Western Asia, conspicuous in the world's history for over twenty-five centuries. In early times it was important as a boundary. It was the eastern border of the Jewish kingdom; it separated Assyria from the Khita, or Hittites; it divided the eastern from the western satrapies of Persia, and at several periods was the boundary of the Roman Empire. Arabic geographers as late as A.D. 1200 mention a large number of important cities on its shores and islands. The middle Euphrates to-day flows past a mass of ruins. From an early period, antedating 3000 B.C., it was the highway of commerce between East and West, and numerous empires have left their records on its shores.

The length of the river, from its source at Diadin to the sea, is about 1,800 miles. The area of its basin is 260,000 square miles, or about as great as that of the state of Texas. Its course is mainly southeasterly through the great alluvial plains of Babylonia and Chaldea; it flows into the Persian Gulf by several mouths, of which only one in Persian territory is navigable. It is joined by the Tigris about 100 miles from its mouth, when the united streams take the name of Shat-el-Arab. In the Old Testament the Euphrates is called the Great River. For map, see ASIA.

EUREKA, *u re'ka,* CAL., the county seat of Humboldt County, on Humboldt Bay, on the northwest coast of the state, 225 miles northwest of San Francisco. An excellent natural harbor has been improved by the Federal government, and steamers sail regularly between this and other Pacific coast ports. Eureka is now connected with San Francisco by the Northwestern Pacific Railroad. In 1910 the population was 11,845; in 1916 it was estimated to be 14,684. The city is in the famous redwood region. It has a large trade in redwood lumber, shingles, apples, wool, butter and fish. The industries include wood-working mills, a woolen mill, an iron foundry, a tannery, tobacco factories and marble and granite works.

Settled in 1850, Eureka was incorporated and made the county seat in 1856. The more prominent buildings are a Federal building, courthouse, city hall, county jail and hospital. Near the city is Sequoia Park, a redwood forest forty acres in extent.

EUREKA SPRINGS, ARK., a city in the extreme northwestern part of the state near the Missouri border, famous for its group of fifty medicinal springs and for its healthful climate. It is one of the county seats of Carroll County (the other is Berryville) and had a residential population of 3,228 in 1910. This number is greatly increased throughout the year, however, by transients in pursuit of health and pleasure, for aside from its beneficial waters, the place is attractive for its delightful location 1,800 feet above sea level, in the midst of some of the most picturesque scenery of the Ozark Mountains. Joplin, Mo., is seventy-two miles northwest, and Springfield, Mo., is eighty-five miles northeast. The

city is served by the Missouri & North Arkansas Railroad, and is within a twelve-hour ride from Saint Louis, Kansas City, Dallas, Memphis or Little Rock.

Though the city is primarily a health resort, the agricultural resources of the vicinity offer inducements to the home-builder. A great variety of fruits and abundant supplies of alfalfa are grown in the vicinity; there is also excellent timber, and a fine grade of onyx is found. The city has several large hotels, a Carnegie Library, a high school and Crescent College for Girls.

The first settlement was made in 1879 and named *Eureka,* a Greek word meaning *I have found it;* the following year the city was chartered. The springs are held in trust by the city and the waters are free to the public. The city is operated under the commission form of government. J.B.

EURIPIDES, *u rip' i deez* (about 480-406 B. C.), a poet of Greece, accorded by common consent the third place among the Greek masters of tragedy. He is said to have written a drama at the age of eighteen; but his first play was brought out when he was twenty-five. In 441 B. C., at the age of thirty-nine, he contended for the tragic prize, bringing out a series of four dramas, one of which was the *Medea.* The first prize was given to a son of Aeschylus, the second to Sophocles, and the third to Euripides. From this time Euripides and Sophocles were friendly competitors for dramatic honors.

In 408 B. C., at the age of seventy-two, Euripides brought out at Athens his tragedy of *Orestes.* Directly afterward he was invited by King Archelaus to go to the kingdom of Macedon, for the king was desirous that Greeks of culture should reside in his dominions. Here Euripides completed several of his dramas known to-day, but he died two years after he took up his residence in Macedon. By none was he mourned more than by the aged Sophocles, his great rival, who was then bringing out the last of his tragedies at Athens. Sophocles clothed himself in mourning and ordered the actors to present themselves in funeral attire. The Athenians set up a bust of Euripides in the public place, and Thucydides composed an inscription which was placed on a monument built in his honor.

The men whose names are foremost in Greek literature—Aeschylus, Sophocles, Socrates and Aristophanes—were contemporaries of Euripides. The poet had the misfortune to make an enemy of Aristophanes, whose sneers are still voiced by many critics. According to some authorities Euripides composed ninety-two tragedies. The following are the titles of the extant dramas, arranged in the order of their composition: *Alcestis; Medea; Hippolytus; Hecuba; Ion; Supplicants; Heracleidae; Mad Hercules; Troades; Electra; Helena; Phoenissae; Iphigenia in Tauris; Andromache; Orestes; Bacchae; Cyclops; Iphigenia at Aulis.* M.R.T.

EUROPA, *u ro' pa,* according to Greek legend, a daughter of Phoenix, king of Phoenicia, or of Agenor, and the sister of Cadmus. She was admired by Jupiter, who appeared in the form of a white bull, and carried her to Crete. The myth inspired several notable paintings, the most celebrated of which is that by Paul Veronese in the Ducal Palace, Venice. Another, by Titian, is at Cobham Hall, England. Contrary to belief sometimes expressed, the word *Europe* is not derived from this name. See explanation in article EUROPE.

EUROPE, the smallest of the continents, with the exception of Australia. Its area of 3,754,282 square miles is only about 25,000 square miles greater than that of Canada, but while Canada is one country, Europe consists of no fewer than twenty-six separate nations. Geographically, it is really a peninsula jutting out from the vast continent of Asia, and the combined land mass of the two continents is often spoken of as *Eurasia.* This peninsulalike character

EUROPE

AREA AND POPULATION

Political Divisions	Area Sq. Mi.	Population 1910	Population Per Sq. Mi.	Capital	Population 1910	Other Important Towns	Population 1910
Albania	11,317	*825,000	72.6	Durazzo †	*5,000	Skutari	*32,000
Austria-Hungary	261,259 ‡	51,109,471	195.6	{ Vienna	2,149,800	Prague	591,500
				{ Budapest	880,371		
Belgium	11,373	7,423,784	652.7	Brussels and suburbs	663,647	Antwerp	312,884
Bulgaria	43,310	4,752,997	109.7	Sofia	102,812	Philippolis	47,981
Denmark	15,592	2,757,076	176.7	Copenhagen	462,161	Aarhus	61,755
France	207,054	39,601,509	192.2	Paris	2,888,110	Marseille	550,619
Germany	208,780	*67,812,000	324.8	Berlin	2,071,257	Hamburg	931,035
Great Britain and Ireland (a)	121,633	45,370,530	373.0	London	7,251,358	Liverpool	746,421
Greece	41,933	*4,821,832	114.9	Athens	(b) 167,479	Saloniki	(c) 160,000
Italy	110,632	*36,120,118	326.4	Rome	*590,960	Naples	*697,917
Luxemburg	998	259,899	260.4	Luxemburg	20,848		
Montenegro	5,600	*516,000	92.1	Cetinjé	*5,500	Podgoritza	*14,000
Netherlands, The	12,648	*6,339,705	501.2	The Hague	312,430	Amsterdam	*609,084
Norway	124,642	2,392,698	19.2	Christiania	241,834	Bergen	76,867
Portugal	35,490	5,975,985	168.3	Lisbon	435,359	Oporto	194,009
Rumania	53,489	(d) 7,508,009	140.3	Bukharest (Bucharest)	*345,628	Jassy	*76,120
Russia §	1,867,737	*128,864,300	69.1	Petrograd	*2,133,100	Moscow	*1,817,100
Serbia	33,891	4,547,990	134.1	Belgrade	90,890	Monastir	59,850
Spain	194,783	*20,355,983	104.5	Madrid	599,807	Barcelona	587,411
Sweden	172,963	*5,679,607	32.8	Stockholm	*386,270	Goteborg	*181,500
Switzerland	15,976	*3,877,210	242.6	Bern	*94,700	Zürich	*205,000
Turkey	10,882	*1,891,000	173.7	Constantinople	*1,000,000	Adrianople	*83,000

* Recent official estimate.

† Provisional capital. ‡ Including Bosnia and Herzegovina. § Figures are for European Russia. (a) The divisions composing the United Kingdom are: England, 50,874 sq. m.; Wales, 7,466 sq. m.; Scotland, 30,405 sq. m.; Ireland, 32,586 sq. m.; Isle of Man, 227 sq. m.; Channel Islands, 75 sq. m. (b) Census of 1907. (c) Provisional census of 1913. (d) Census of 1912.

PRINCIPAL RIVERS

Name	Outlet	Length Miles	Drainage Sq. Mi.	Name	Outlet	Length Miles	Drainage Sq. Mi.
Danube	Black Sea	1,644	315,435	Memel (Niemen)	Kurisches Haff	437	34,965
Dnieper	Black Sea	1,064	203,460	Oka	Volga River	706	93,205
Dniester	Black Sea	646	29,675	Petchora	Arctic Ocean	915	127,225
Don	Sea of Azof	980	166,125	Po	Adriatic Sea	354	28,920
Donets (Donetz)	Don River	487	37,890	Rhine	North Sea	709	63,265
Douro	Atlantic Ocean	485	36,705	Rhone	Gulf of Lion	447	38,180
Drave	Danube River	434	15,745	Save	Danube River	535	37,595
Düna (Dwina)	Gulf of Riga	470	32,975	Seine	English Channel	425	30,030
Ebro	Mediterranean Sea	475	38,580	Tagus	Atlantic Ocean	566	31,865
Elbe	North Sea	612	55,340	Theiss (Tisza)	Danube River	550	59,350
Kama	Volga River	984	202,615	Ural	Caspian Sea	1,446	96,350
Loire	Bay of Biscay	543	46,755	Vistula	Baltic Sea	596	73,905
Meuse	Waal River	530	12,740	Volga	Caspian Sea	1,977	563,300
Mezen	White Sea	496	30,410	Vyatka	Kama River	596	50,555

PRINCIPAL LAKES

Name and Location	Area Sq. Mi.	Depth† Feet	Name and Location	Area Sq. Mi.	Depth† Feet	Name and Location	Area Sq. Mi.	Depth† Feet
Balaton, Hungary	266	13	Geneva, France, Switzerland	225	1,015	Neagh, Ireland	153	113
Como, Italy	56	1,360	Ilmen, Russia	358		Neuchâtel, Switzerland	85	500
Constance, Germany Switzerland	208	825	Ladoga, Russia	7,004	703	Onega, Russia	3,765	1,200
Enare, Russia	549		Maggiore, Italy, Switzerland	82	1,220	Ulea, Russia	380	60
Garda, Italy, Austria	143	1,135	Mjösen, Norway	152	1,485	Vener, Sweden	2,149	280
						Vetter, Sweden	733	415

* Greatest depth.

PRINCIPAL MOUNTAINS

Systems and Highest Summits	Elevation Feet	Systems and Highest Summits	Elevation Feet	Systems and Highest Summits	Elevation Feet*
Alps		Alps. *continued*		Scattered Highlands	
(1) *Western Division*		(2) *Central Division*		Apennines	9,560
Dent Blanche	14,385	Aletschorn	13,721	Auvergne	6,186
Dom (Mischabelhörner)	14,942	Finsteraarhorn	14,026	Balkan	7,786
Lyskamm	14,889	Gross Fiescherhorn	13,285	Carpathian	8,737
Matterhorn	14,782	Gross Schreckhorn	13,386	Despoto Dagh	10,000
Mont Blanc	15,782	Jungfrau	13,669	Etna	10,755
Monte Rosa	15,272	Mönch	13,468	Pyrenees	11,168
Mont Maudit	14,669	Piz Bernina	13,304	Sierra Nevada	11,420
Nord End (Monte Rosa)	15,132	(3) *Eastern Division*		Scottish Highlands	4,406
Pointe des Écrins	13,462	Gross Glockner	12,461	Scandinavian Alps	8,399
Täschorn	14,758	Gross Venediger	12,008	Ural Mountains	5,355
Weisshorn	14,804	Ortler	12,802		

* Highest point in range

Strait of Denmark
ICELAND (Den.)
Reikiavik
Akreyri
Mt. Hekla
C. Langanes
Diupivogr
Thistill F.
Hunafloi Fiord
JAN MAYEN
ARCTIC CIRCLE
LOFODEN IS.
Tromsø
Bodo
West Fiord
FAROE IS. (Den.)
SHETLAND IS.
ORKNEY IS.
HEBRIDES
BRITISH ISLES
ATLANTIC OCEAN
TO MONTREAL 2600
NEW YORK TO QUEENSTOWN
NEW YORK TO SOUTHAMPTON 3091
BARBADOS TO LIVERPOOL 3624
PARA TO LIVERPOOL
Moray Firth
Inverness
Aberdeen
Dundee
Firth of Forth
Edinburgh
Glasgow
Belfast
Londonderry
Sligo
Galway
Limerick
Cork
Queenstown
Dublin
Waterford
Irish Sea
Liverpool
Manchester
Leeds
Hull
Sheffield
Newcastle
Birmingham
Cardiff
Bristol
Plymouth
Lands End
St. George's Channel
Southampton
LONDON
ENGLISH CHANNEL
NORTH SEA
Bergen
Christiania
Stavanger
Egersund
Arendal
Christiansand
The Naze
Trondhjem
Christiansund
Molde
Dovrefield
Bremangerland
Floro
Skien
Drammen
Fredericksstad
Frederickshald
Gottenborg
Halmstad
Kalmar
Karlskrona
Jonkoping
Linkoping
Norrkoping
Nykoping
Visby
GOTLAND
OLAND
L. Malar
L. Wener
L. Wetter
Westeras
Upsala
Stockholm
Falun
Soderhamn
Sundsvall
Hernosand
Ostersund
Umea
Gulf of Bothnia
Vik
Cattegat
Skagerack
Aalborg
Randers
Aarhus
Helsingborg
Malmo
Copenhagen
BORNHOLM
BALTIC SEA
Kiel
Lubeck
Hamburg
Altona
Bremen
Hanover
Stettin
Danzig
Brunswick
BERLIN
Posen
Magdeburg
Halle
Leipzig
Dresden
Breslau
Cassel
Elberfeld
Cologne
Frankfort
Erfurt
Chemnitz
Mainz
Mannheim
Karlsruhe
Nuremberg
Stuttgart
Augsburg
Munich
Prague
Pilsen
Budweis
Brunn
Danube R.
Linz
Salzburg
VIENNA
Budapest
Gratz
Innsbruck
Laibach
Trieste
Agram
Fiume
Belgrade
Banjaluka
Sarajevo
BOSNIA
Spalato
Cetinje
Durazzo
Amsterdam
Hague
Rotterdam
Brussels
Lisle
Luxemburg
Rheims
St. Quentin
Amiens
Rouen
Havre
Boulogne
Cherbourg
Brest
Rennes
Le Mans
Versailles
PARIS
Orleans
Tours
Angers
Nantes
St. Nazaire
Troyes
Nancy
Strassburg
Besançon
Dijon
Basel
Bern
SWITZERLAND
Zurich
Lyons
St. Etienne
Clermont Ferrand
Limoges
Poitiers
Rochefort
Bordeaux
Bayonne
San Sebastian
Bilbao
Santander
Gijon
Oviedo
Coruna
Ferrol
Vigo
C. Finisterre
Santiago
Leon
Burgos
Vitoria
Pamplona
Cantabrian Mts.
Valladolid
Braga
Oporto
Coimbra
Salamanca
Sierra de Guadarrama
MADRID
Saragossa
Toledo
Ciudad Real
Badajoz
Elvas
Evora
LISBON
Setubal
C. St. Vincent
Faro
Sra. Morena
Cordoba
Seville
Jaen
Granada
Sra. Nevada
Malaga
Almeria
Cartagena
Murcia
Lorca
Alicante
Valencia
Castellon
Cuenca
Tortosa
Tarragona
Barcelona
Gerona
Lerida
Reus
Pyrenees
Toulouse
Pau
Montpellier
Nimes
Marseille
Toulon
G. of the Lion
Nice
Monaco
Genoa
Turin
Milan
Verona
Parma
Modena
Bologna
Ferrara
Ravenna
Ancona
Pisa
Leghorn
Perugia
ROME
Tiber R.
Naples
Mt. Vesuvius
Salerno
Foggia
Bari
Brindisi
Taranto
G. of Taranto
Cosenza
Reggio
Messina
Str. of Messina
Catania
Syracuse
Mt. Etna
SICILY
Palermo
Girgenti
Valetta
MALTA (Br.)
CORSICA
Ajaccio
Bastia
Str. of Bonifacio
Sassari
SARDINIA
Oristano
Cagliari
TYRRHENIAN SEA
IONIAN SEA
Corfu
BALEARIC IS.
MAJORCA
MINORCA
IVIZA
Palma
Str. of Gibraltar
Gibraltar (Br.)
Tangier
Ceuta
Melilla
Fez
MOROCCO
Oran
Algiers
ALGERIA
Constantine
Tunis
TUNIS
Sfax
PANTELLARIA
MEDITERRANEAN SEA
AFRICA
NEW YORK TO GIBRALTAR
Longitude West 0 Longitude East
Hammond's 8"x11 Map of Europe.
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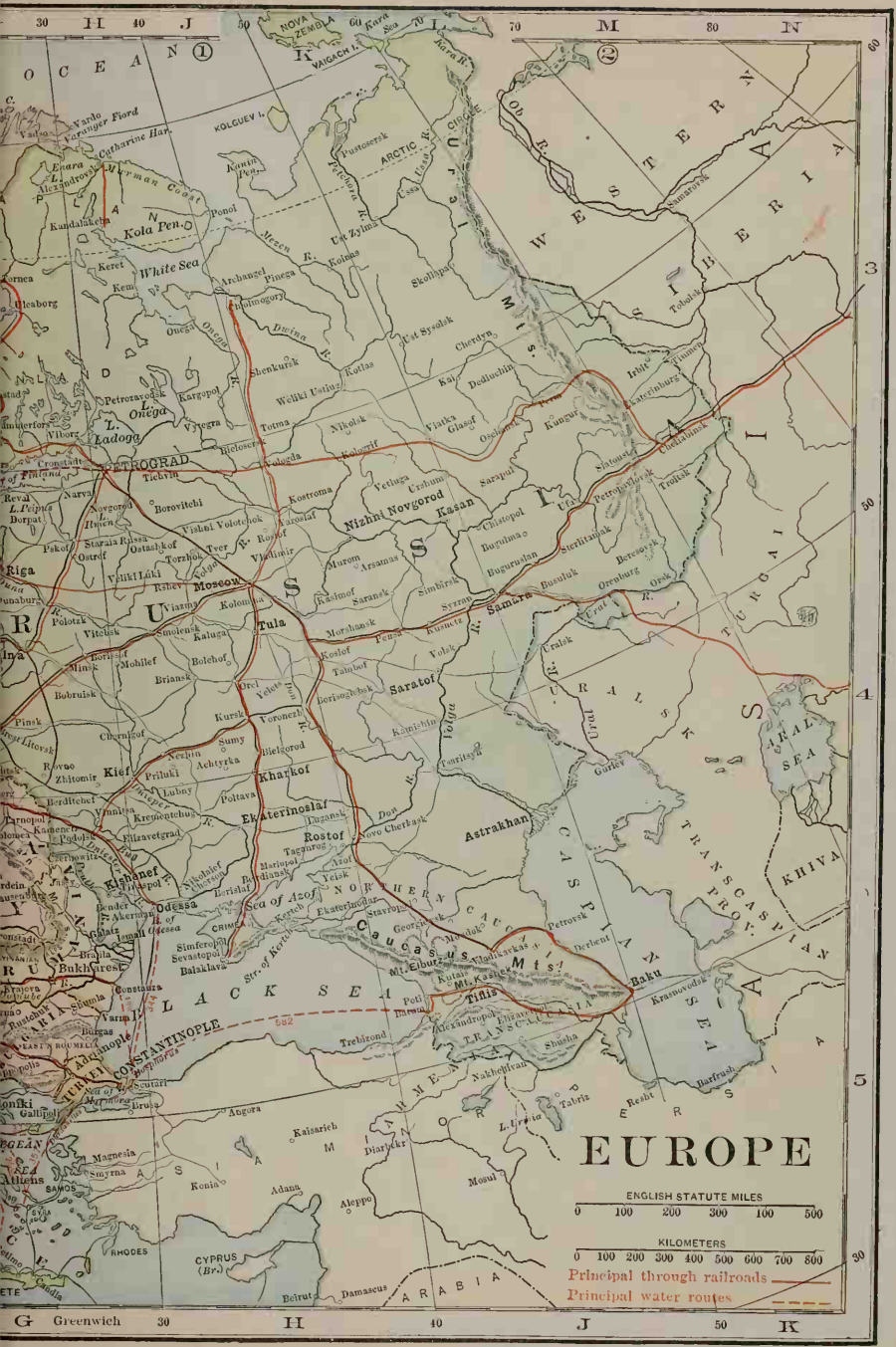

EUROPE
ENGLISH STATUTE MILES
0 100 200 300 100 500
KILOMETERS
0 100 200 300 400 500 600 700 800
Principal through railroads
Principal water routes
Greenwich
30 H 40 J 50 K
60 L 70 M 80 N
OCEAN
NOVA ZEMBLA
VAIGACH I.
Karsk Sea
Kara R.
KOLGUEV I.
Varlo
Varanger Fjord
Catharine Har.
Wyrman Coast
Kola Pen.
White Sea
Archangel
Pinega R.
Onega
Onega R.
Dwina R.
Petrozavodsk
Kargopol
L. Onega
L. Ladoga
Vytegra
Totma
Vologda
Kolguif
Nikolsk
Ust Syssolsk
Cherdyn
Ural Mts.
Kama R.
Viatka
Glasof
Kungur
Perm
Ufa
Chelabinsk
Troitsk
Tobolsk
Tumen
Irbit
Ekaterinburg
WESTERN SIBERIA
Samarovsk
Obdorsk
Ob R.
Petrograd
Tichvin
Reval
Narva
Finland
Gulf of Finland
Borovitchi
Novgorod
Ilmen L.
Vishni Volotchok
Torzhok
Tver
Volga R.
Vladimir
Nizhni Novgorod
Kasan
Chistopol
Bugulma
Bugurushlan
Sterlitamak
Berezovka
Orenburg
Orsk
Ural R.
Uralsk
Gurief
Caspian Sea
Aral Sea
Khiva
Transcaspian Prov.
Moscow
Kolomna
Riga
Pskof
Ostrof
Staraia Russa
Ostashkof
Velikiye Luki
Vitebsk
Smolensk
Kaluga
Tula
Ryazan
Moshaisk
Kashira
Penza
Samara R.
Samara
Syzran
Simbirsk
Saransk
Arsamas
Murom
Radimof
Kasimof
Volsk
Tetiushi
Saratof
Balakovo
Borisoglebsk
Tambof
Reshef
Kozlof
Orel
Yelets
Voronezh
Kursk
Borisof
Mohilef
Bolchof
Briansk
Minsk
Bobruisk
Pinsk
Chernigof
Rovno
Zhitomir
Kief
Priluki
Nezhin
Achtyrka
Sumy
Belgorod
Kharkof
Lubny
Poltava
Kremenchug
Ekaterinoslaf
Dnieper R.
Dniester R.
Don
Donetz R.
Rostof
Taganrog
Novo Cherkask
Astrakhan
Volga R.
Kamishin
Tsaritsyn
Mariupol
Berdichef
Vinnitsa
Tarnopol
Kamenetz Podolsk
Proskurof
Zlotchef
Volochisk
Ternopol
Kishenef
Akerman
Bender
Odessa
Sea of Azof
Kertch
Yenikale
Ekaterinodar
Novorossisk
Crimea
Simferopol
Sevastopol
Balaklava
Black Sea
Str. of Kertch
Caucasus Mts.
Mt. Elburz
Mt. Kasbek
Georgievsk
Vladikavkas
Petrovsk
Derbent
Baku
Tiflis
Poti
Batum
Alexandropol
Erivan
Transcaucasia
Kuban R.
Yeisk
Krasnovodsk
Shusha
Nakhichevan
Darfrash
Tabriz
Lake Urmia
Persia
Rustchuk
Silistria
Varna
Bukharest
Constanza
Roumania
Bulgaria
Eastern Roumelia
Turkey
Constantinople
Adrianople
Dardanelles
Gallipoli
Salonika
Aegean Sea
Athens
Smyrna
Magnesia
Samos
Rhodes
Crete
Konia
Adana
Aleppo
Kaisarieh
Diarbekr
Mosul
Angora
Trebizond
Sivas
Cyprus (Br.)
Beirut
Damascus
Arabia
582

EUROPE BY CENTURIES FROM THE DISCOVERY OF AMERICA

	Great Britain	Germany	France	Other Countries
1492	92 Henry VII invades France	93 Maximilian I Emperor	99 Conquest of Milan	92 Discovery of America by Columbus
1500	09 Henry VIII, king	12 Empire divided into 10 circles	15 Francis I invades Italy	03 Naples annexed to Spanish crown
	12 War with France	17 Luther's Ninety-five Theses	21 Wars with Charles V	10 Tartar invasions of Russia
	13 Battle of Flodden Field	19 Charles V King of Spain	32 Struggle for possession of Italy	19 Cortez conquers Mexico
	43 Invasion of France	21 Diet of Worms	47 Henry II and Catherine de Medici	32 Union of Norway & Denmark
	47 Protestantism formally established	29 Turks invade Germany	62 Religious liberty granted Huguenots	33 Ivan the Terrible, Czar of Russia
	53 "Bloody Mary" Queen of England	43 Alliance with England against France	72 Massacre of St. Bartholomew	60 War between Sweden and Denmark
	58 Elizabeth ascends throne	51 Treaty of Passau	76 Catholic League	78 Alliance of Sweden & Poland against Russia
	64 Church of England established	56 Charles V abdicates	77 Sixth Religious War	79 Dutch Republic independent
	85 War with Spain	94 Union of Protestants at Heilbronn	88 Revolt of Paris	80 Portugal under Spanish dominion
1600	03 Union of England and Scotland	16 Beginning of Thirty Years War	14 Last assembly of states-general	10 Expulsion of Moors
	07 English settlement at Jamestown	20 Massacre of Prague	24 Cardinal Richelieu in power	11 Gustavus Adolphus, King of Sweden
	20 Pilgrims sail in Mayflower	29 Gustavus Adolphus lands in Germany	27 War with England	13 Founding of House of Romanoff in Russia
	27 War with France	40 Frederick Wilhelm the Great Elector	38 Invasion of Spain	39 Naval victory of Holland over Spain
	42 Civil War and Revolution	48 Peace of Westphalia	40 French take Turin	45 Peace between Denmark and Sweden
	49 Commonwealth under Cromwell	65 Tyrol united to Austria	49 Siege of Paris	46 Revolt of Naples
	52 War with Holland	73 War of Austria and France	59 Peace of the Pyrenees	54 Spain recovers Portugal from Dutch
	60 Stuarts restored under Charles II	76 General revolt of Hungarians	67 War with Spain	57 Ottoman-Swedish alliance against Poland
	68 Alliance of England, Sweden and Holland against France	80 Part of Alsace seized by France	72 War with Holland 78 Peace with Holland and Spain	71 Cossacks subjugated 74 Sobieski, King of Poland
	85 James II, king	83 Siege of Vienna by Turks	85 Revocation of the Edict of Nantes	78 First War of Russia with Ottoman Empire
	89 War with France	87 Joseph I, King of Hungary	88 War of allies against France	89 Peter the Great rules Russia
	97 General peace	90 Joseph I elected King of the Romans	97 Peace of Ryswick	99 Ottoman power broken
1700	02 Queen Anne's War	01 Hague Alliance	02 Invasion of Holland	00 Wars of Peter the Great
	04 England takes Gibraltar	04 Battle of Blenheim	18 Quadruple Alliance against Spain	02 Chas. XII sweeps Poland and Russia
	07 Act of Union of Eng. and Scotland	18 Quadruple Alliance against Spain	33 War of Polish Succession	07 France and Spain driven out of Italy
	13 Treaty of Utrecht	33 War of Polish Succession	40 War of Austrian Succession	14 Russia conquers Finland
	18 War with Spain	40 War of Austrian Succession	44 War with England and Austria	17 Turks lose Belgrade
	62 War with Spain	45 Francis I and Maria Theresa rule	47 War with Holland	20 Peace of Stockholm
	63 Peace of Paris	56 Seven Years War	63 Loss of Canada	23 Christians expelled from China
	75 War with American colonies	72 Partition of Poland	78 Alliance with America	65 Establishment of England's rule in India
	81 Surrender of Cornwallis	78 Bavaria seized	89 Beginning of French Revolution	74 Revolt of Cossacks in Russia
	83 Independence of U. S. acknowledged	92 War with France	92 France declared a Republic	96 Napoleon's Italian campaign
	97 Nelson destroys French fleet	93 First coalition against France	93 Reign of Terror	97 Swiss revolution
	98 Second coalition against France	97 Napoleon's Austrian campaign	95 Rise of Napoleon Bonaparte	98 Roman republic proclaimed
1800	00 Union of England and Ireland	04 Confederation of the Rhine	04 Napoleon made Emperor	03 Napoleon crowned King of Italy
	03 Successful war in India	13 War of German Independence	05 Battle of Austerlitz	05 Russia joins coalition against France
	12 War with U. S	15 German League—Congress of Vienna	14 House of Bourbon restored	06 Louis Napoleon, King of Holland
	15 Wellington's victory at Waterloo	62 Bismarck made premier	15 Napoleon returns from Elba	14 Union of Sweden and Norway.
	48 Civil war in Ireland	66 First Parliament of German Confederation	Defeat of Napoleon at Waterloo	15 Netherlands united under William I
	50 Punjab annexed to British crown	67 North German constitution accepted	30 The July Revolution	30 Belgium becomes independent
	53 End of Kaffir War	71 King of Prussia proclaimed Emperor of Germany	36 Insurrection attempted by Louis Napoleon	32 Kingdom of Greece founded 38 Rebellion in Hungary
	54 Crimean War	72 Expulsion of Jesuits	52 Louis Napoleon declared emperor	60 War against China by England and France
	60 Rebellion in India subdued	88 Accession of William II	60 Commercial treaty with England	61 Victor Emmanuel II, first King of Italy
	76 Queen Victoria Empress of India	91 Triple Alliance renewed	70 War with Prussia	78 Congress of Berlin
	99 Boer War in South Africa	95 North Sea and Baltic Canal opened	71 Capitulation of Paris—peace restored	96 Russia leases Port Arthur from China
1900	02 End of Boer War	06 Propaganda against Socialism	01 Diplomatic relations with Turkey severed	00 Boxer Rebellion in China
	04 Trade Treaty With Thibet	11 Franco-German agreement over Morocco	05 Moroccan troubles increased	01 Russo-Japan War 06 Norway and Sweden independent kingdoms
	08 Great Britain, France & Russia combine to prevent war over Balkans	12 Socialists make remarkable gains; Defense bill; increase in navy and army; Triple Alliance renewed	07 French occupy Morocco	10 Portugal a Republic Montenegro made a kingdom
	09 House of Commons passes Irish Land bill	14 Ultimatum to Russia	11 Labor riots 12 Protectorate over Morocco	12 China becomes a republic
	14 War declared on Germany	14 War declared on Russia and France	14 Declares war on Austria and Germany	

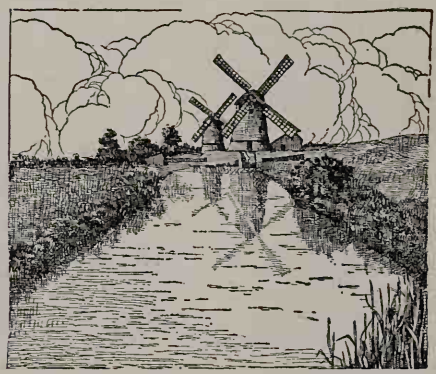
is strikingly evident from the fact that save for Russia and the very easternmost portions of Austria-Hungary, no point in Europe is more than four hundred miles from the sea. Closely as the two continents are connected, however, there has always been a recognized distinction, and dwellers in Asia Minor thousands of years ago gave to the lands across the Aegean the name *Ereb,* or "land of the setting sun," just as they called their own land *Assu,* or "land of the rising sun." Gradually the former name was corrupted into its present form, and was at the same time extended in its significance to cover the whole western continent.

Why Europe is Important. Even if Europe is geographically but a pendant of Asia, it has been the world's most important continent, so far as the history of civilization is concerned. Not without full reason did Tennyson exclaim—

> Better fifty years of Europe than a cycle of Cathay.

True, the very earliest civilizations grew up in Asia and Africa, but these waned centuries before the beginning of the Christian Era, while Europe gradually became the home of most of the important nations of the world. Progress has been almost unknown among other than European peoples. There are in the Americas federations which have made wonderful advance, but these were all founded —and not a great while ago, as history reckons time—by Europeans. The states of Africa which count in the world's affairs are controlled by Europeans, while the two great countries of the East (China and Japan) awakened from their centuries-long sleep only when the nations of Europe and the American republic, founded by Europeans, knocked at their doors. Practically all of the great books and pictures, the music and the sculpture, as well as the inventions and the so-called "comforts of life," have been produced by Europeans or by their descendants.

The People. No other continent is as densely populated as Europe. Asia, it is true, has twice as many inhabitants, but it is so much larger that its density percentage is less than half that of Europe. In the latter continent, with its 480,000,000 people, there is an average of over 125 people to the square mile. They are very unevenly distributed, for the barren northern parts of Sweden and Russia, with their long, bitter winters, are almost unpopulated, while in portions of the fertile north-central plain the people are crowded together until it seems a marvel that they can find means of supporting themselves. Of all the countries Belgium, with 653 people to the square mile, is the most densely populated, while Sweden, with but thirty-two, has fewest people to each square mile. That is, the least densely populated country of Europe has more inhabitants to the square mile than has the United States as a whole, which has but thirty-one.



GREATEST EXTREMES IN ALTITUDE IN WESTERN EUROPE

Mont Blanc rears its summit 15,782 feet above sea level; the low country of Holland is below sea level, and the Dutch dykes have played an important part in the history of the Netherlands.

What is a European? There is no such thing as a European in the sense in which there is an African, for instance; in other words, there is no European race. The ancient Greeks, the earliest civilized inhabitants of the continent, boasted that they sprang from the soil, and that their ancestors had

never migrated from any other land. But it is certain that at some far-distant period the ancestors of the present Europeans did cross into that continent, most of them from Asia, and a few, in all probability, from Africa. Wherever they may have come from originally, ninety-five per cent of them are of the Caucasian, or white, race. Among them, however, there are very pronounced differences, both in appearance and in character. The Norwegians, with their stalwart frames, fair hair and ruddy skin, differ more in appearance from the small, dark-skinned people of Southern Italy than the latter do from certain members of the brown race, while it is difficult to believe that the comparatively unemotional Swedes can belong to the same race as the emotional French.

Customs differ widely, too, and almost every one of the twenty-six countries has its own peculiar dress, to which the peasants have clung long after the upper classes have adopted more cosmopolitan standards. Students of anthropology lay much stress on the shape of the head as an indication of race relationship, and point out that there are two distinct shapes among Europeans—the long head and the broad head; and it is interesting to note that these two types have persisted through the centuries, despite all the intermingling.

The term *Mongolian* compels instant thought of the Chinese and Japanese, but does not suggest any European peoples, yet there are over 20,000,000 of the Mongol race in Europe —all of that five per cent who are not Caucasians. They include the Magyars, or Hungarians, the Finns, the Turks and the Bulgarians, who are characterized by the straight, dark hair, yellowish skin and broad cheek bones which are typical of the race.

Language. About sixty different languages are spoken by the nations which inhabit Europe to-day. Some of these languages, like German, English and French, are the mother-tongues of millions of people; others, like Icelandic and Basque, are spoken only by a few thousands. Most of these languages are broken up into a number of dialects, some of which are understood only with great difficulty even by people who speak the same tongue. According to their origin the European languages belong to three great branches —the Teutonic, the Slavonic and the Romanic, or Neo-Latin—which are all members of one great group, known as the Indo-European group. Hungarian, Turkish and Finnish are the only principal languages that belong to another group, the Turanian.

The following list contains the principal languages spoken in each country of Europe:

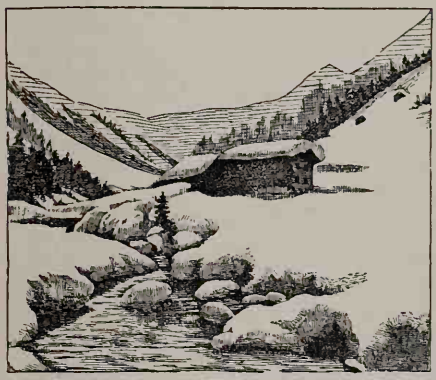
Albania:	Albanian.
Austria:	German, Bohemian (in Bohemia), Polish (in Galicia), Ruthenian (in Galicia and Bukovina), Croatian (in Carniola and Bosnia), Serbian (in Dalmatia and Herzegovina), Rumanian (in Bukovina), Italian (in Trentino and Trieste) and Ladin (in Trentino).
Belgium:	French, Flemish, Walloon.
Bulgaria:	Bulgarian, Turkish, Armenian, Gypsy dialects.
Denmark:	Danish, Icelandic (in Iceland).
France:	French, Provençal (in the south), Basque (on the slopes of the Pyrenees), Low Breton (in Brittany, northwest of France).
German Empire:	German, Polish (in Eastern Prussia), French (in Alsace-Lorraine).
Greece:	Greek, Bulgarian, Albanian, Rumanian, Turkish.
Hungary	Hungarian, Croatian (in Croatia-Slavonia), Serbian (in the Banat), Slovenian (in Croatia-Slavonia), Slovakish (along the western slopes of the Carpathians), Rumanian (in Transylvania) and Gypsy dialects.
Italy:	Italian.
Montenegro:	Montenegrin.
Netherlands:	Dutch, Flemish.
Norway:	Norwegian.
Portugal:	Portuguese.
Rumania:	Rumanian, Bulgarian, Armenian, Gypsy dialects.
Russia:	Russian, Ruthenian or Little Russian, Bielo-Russian or White Russian, Polish, Lithuanian, Lettish, Finnish, Esthonian, Livonian, Tatar, Turkish, Kalmuk, Lappish, Rumanian.
Serbia:	Serbian, Albanian.
Spain:	Spanish, Basque (on the slopes of the Pyrenees).
Switzerland:	German, Italian, French, Ladin.
Turkey:	Turkish, Greek, Bulgarian.
United Kingdom:	English, Welsh (in Wales), Gaelic (in Scotland), Irish, Manx (in Isle of Man).

Religion. Christianity did not originate in Europe, but dates there from Paul's vision of the man who pleaded, "Come over into Macedonia and help us"; however, that continent has been the great stronghold of the faith, and to-day about ninety-five per cent of Europeans are Christians. The three great branches of

the Christian Church are the Protestant, the Orthodox, or Greek, and the Roman Catholic, the last having by far the greatest number of adherents. The remaining five per cent of the people are for the most part Mohammedans or Jews.

Some Interesting Measurements. The northernmost point of the mainland of Europe is North Cape, far up in the polar ice in latitude 71° 11′ north; its southernmost limit is Cape Tarifa, in Spain, at 36° north. In its east and west direction it extends from Cape de Roca in Portugal, 9° 27′ west, to a spot in the Ural Mountains of Russia at 66° 21′ east. Its greatest dimension east and west is 3,293 miles; its greatest length from north to south, about 2,400 miles. The coast line of Europe is of peculiar interest, for it is much longer in proportion to area than that of any other continent. The usual method of reckoning, which takes account only of the larger inlets, gives its total length as about 20,000 miles, while another, which includes the small gulfs and bays and river mouths, makes it almost 48,000 miles. In its altitude Europe has no such extremes as has Asia or even North America, for its loftiest mountain peak, the famous Mont Blanc (which see), is but 15,782 feet in height, while its deepest depression, the Caspian Sea, is but eighty-six feet below the level of the sea.

Main Physical Features. The details of the surface formation of Europe are given in articles treating the separate countries; here it is necessary to consider only such features as exercise a real influence on the climate, the industries or the history of the continent. Of the utmost importance are its coast waters, which include the Arctic Ocean, the White Sea, the Caspian Sea, the Black Sea, the Sea of Azov, the Bosporus, the Sea of Marmora, the Dardanelles, the Aegean, the Mediterranean and the Adriatic seas, Strait of Gibraltar, the Atlantic Ocean, Bay of Biscay, English Channel, North Sea, Gulf of Bothnia and Baltic Sea. The detailed history of Europe could not be written without a consideration of most of these, nor could the economic progress of its many peoples be understood, for only these numerous coast waters could have made it possible for many nations to develop in this comparatively small area. Islands, too, are numerous, and have played a very important part, the British Isles, especially, ranking as one of the main divisions of the continent.



EXTREMES OF CLIMATE

When the condition exists in Norway which is shown at the left, sunny Italy enjoys almost a tropical clime.

Highlands and Lowlands. A relief map of Europe shows a certain resemblance to that of North America, in that there are two highland or mountain regions, with a lowland region between. In America the trend of these is north and south; in Europe it is east and west. The great highland region of Europe is in the south and extends across the continent from the coast of Portugal to the Black Sea, while spurs of it jut southward into the various peninsulas. The islands off the southern coast are mere outcroppings of partially submerged mountain ranges, separated from the mainland by shallow seas. This Mediterranean highland district is about 800,000 square miles in area, and includes the Balkans, the Apennines, the Pyrenees and, as its dominating height, the Alps. The influence of geography on history

is strikingly evidenced in this region. There are no great plains where large nations might develop, but in every valley or small plain a little state grew up, quite distinct in most instances from the next little state just over the mountains. Especially in the histories of Greece and Italy was this tendency apparent. Only in very modern times, when mountains were no longer effective barriers, was the old tendency towards isolation overruled, and thus engineers deserve their share of credit, along with the patriots, in the formation of a united Italy.

The other highland region, in the northwest, is less extensive, but includes much of Finland, Norway and Sweden, Scotland and Ireland. The actual mountain region is very unproductive, because the best soil was carried away ages ago by the glaciers, but the sea is close at hand and fishing is profitable enough to make up for the lack of agricultural possibilities.

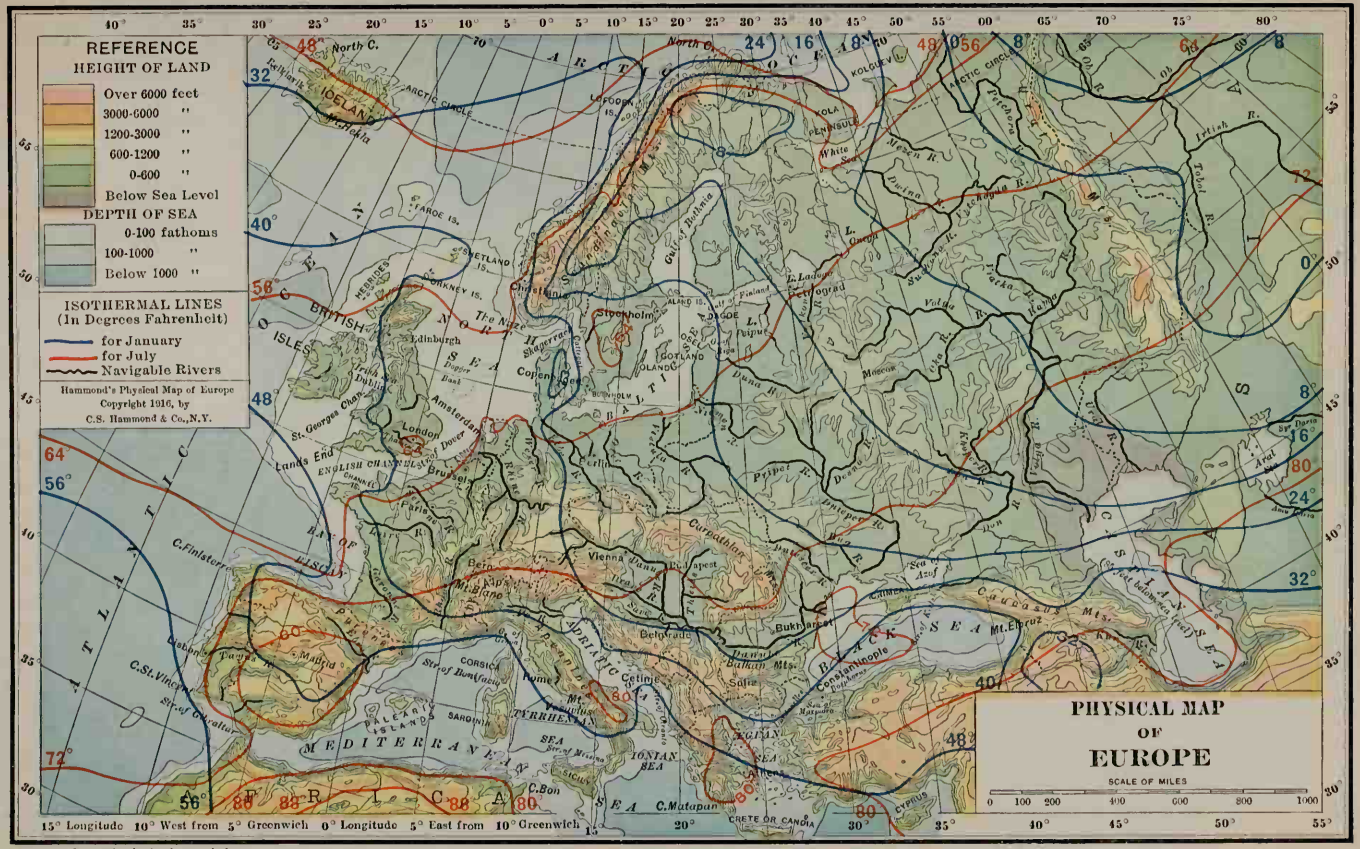
The most important part of Europe, however, is the great lowland province, extending from the Atlantic to the eastern boundary of the continent. Most of Russia, Austria-Hungary, Germany, Denmark, Holland, Belgium, France and England lie in it, so that it is without doubt one of the most important plains in all the world. In most places the soil is fertile, and this, together with its navigable rivers and the absence of high mountains which prohibit easy intercourse, accounts in large measure for the wonderful development of the nations which make their homes upon it.

Waters. There is no well-marked Great Divide in Europe, but the main watershed has a winding direction from southwest to northeast (see DIVIDE). From the Alps descend the Rhine, the Rhone and the Po, while the Danube, greater than any of these, rises in the Black Forest, north of the Alps. The longest river of Europe is the Volga (which see), which after a course of almost 2,400 miles empties into the Caspian Sea. Other rivers are the Meuse, the Scheldt, the Loire, the Marne, the Seine, the Elbe, the Main, the Vistula, the Diester and the Don, and these, with many more, are given separate treatment in these volumes. Of lakes the continent has many. There are, most famous of all, the wonderfully beautiful lakes of the Alpine region; those of the celebrated Lake Region of England; the Scandinavian basins; and the largest of European fresh-water bodies, lakes Onega and Ladoga in Russia. Between Europe and Asia lies the greatest salt-water lake in the world—the Caspian Sea.

Climate and Vegetation. No other continent lies so largely within the temperate zone as does Europe. It is crossed in the extreme north by the Arctic Circle, but it alone of all the continents nowhere extends into the torrid zone. Owing to the closeness of most parts of the continent to the sea, the climate is remarkably mild and genial, considering the latitude. Russia, however, is removed from the equalizing influence of the sea breezes, and has what is known as a "continental climate," with extremes of heat and cold. The southern peninsulas, cut off by the mountains from the northern winds and open to the influences of the Mediterranean, have a climate far more mild and uniform than that of corresponding latitudes in North America. Naples, for instance, is in about the same latitude as Pittsburgh, but has an almost subtropical climate, while the American city is subject to bitter winter temperatures and sweeping blizzards. See CLIMATE, and the map in the article RIVIERA.

Europe has no desert areas, and almost everywhere there is enough rainfall for agriculture, though in Russia, near the shores of the Caspian Sea, there is a very dry stretch. In some places, as in Spain, irrigation is necessary, for while there is plenty of rain, it falls after the growing season and is of no use for crops.

Vegetation. Because of the generally mild climate and plentiful rainfall, there is vegetation everywhere in Europe. In the near-desert region of Russia, referred to above, only grass will grow, while in the Arctic region the peculiar tundra conditions prevail (see TUNDRA), but almost everywhere else trees and flowering plants are abundant. Farthest north is the zone of the cone-bearers, the pines, firs and spruces, and next come the oak and the beech woods. Well down through the Middle Ages the north-central plains of Europe were but a great forest, in the clearings of which settlements had sprung up. In the southern part of the continent the olive is characteristic, but almost any tree will grow which has thick, leathery leaves that allow but slow evaporation of the tree's moisture. The details of the agricultural production of Europe are given in the articles on the various countries, but it is interesting, and to a dweller in North America astonishing, to learn that Europe, in normal times, produces more wheat, more oats,



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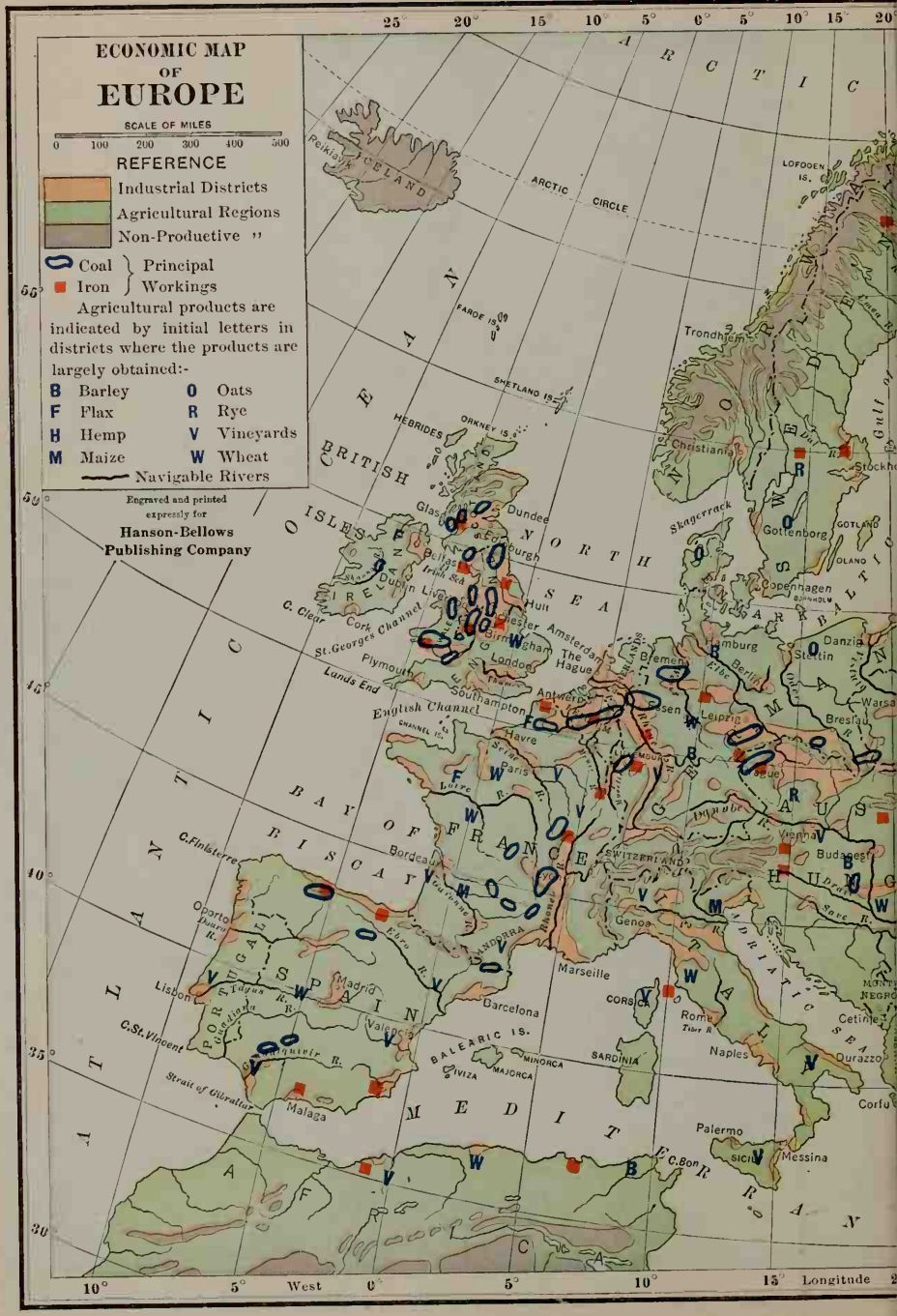
ECONOMIC MAP
OF
EUROPE
SCALE OF MILES
0 100 200 300 400 500
REFERENCE
Industrial Districts
Agricultural Regions
Non-Productive "
Coal } Principal
Iron } Workings
Agricultural products are indicated by initial letters in districts where the products are largely obtained:-
B Barley
F Flax
H Hemp
M Maize
O Oats
R Rye
V Vineyards
W Wheat
Navigable Rivers
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ARCTIC
ICELAND
Reikiavik
ARCTIC CIRCLE
LOFODEN IS.
FAROE IS.
SHETLAND IS.
ORKNEY IS.
HEBRIDES
NORWEGIAN SEA
BRITISH ISLES
NORTH SEA
Trondhjem
Christiania
Stockholm
Skagerrack
Gottenborg
GOTLAND
OLAND
BALTIC SEA
Copenhagen
BORNHOLM
Gulf of Bothnia
Glasgow
Edinburgh
Belfast
Irish Sea
Dublin
Liverpool
Hull
Manchester
Birmingham
Amsterdam
The Hague
Hamburg
Bremen
Berlin
Danzig
Stettin
Warsaw
Breslau
Leipzig
Dresden
Cologne
Rhine R.
Meuse R.
Thames R.
London
Antwerp
Southampton
Plymouth
Lands End
English Channel
CHANNEL IS.
Havre
Seine R.
Paris
Loire R.
Rhone R.
Lyons
Geneva
SWITZERLAND
Vienna
Budapest
Danube R.
Theiss R.
Save R.
Bosna R.
Genoa
Po R.
Adige R.
Marseille
Bordeaux
Garonne R.
Pyrenees
ANDORRA
Oporto
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Lisbon
Tagus R.
Madrid
Guadiana R.
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Ebro R.
Valencia
Guadalquivir R.
Seville
Strait of Gibraltar
Malaga
BALEARIC IS.
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IVIZA
MAJORCA
CORSICA
SARDINIA
Rome
Tiber R.
Naples
Cetinje
MONTE NEGRO
Durazzo
Corfu
Palermo
SICILY
Messina
C. Bon
ATLANTIC
BAY OF BISCAY
C. Finisterre
C. St. Vincent
MEDITERRANEAN
ADRIATIC SEA
25° 20° 15° 10° 5° 0° 5° 10° 15° 20°
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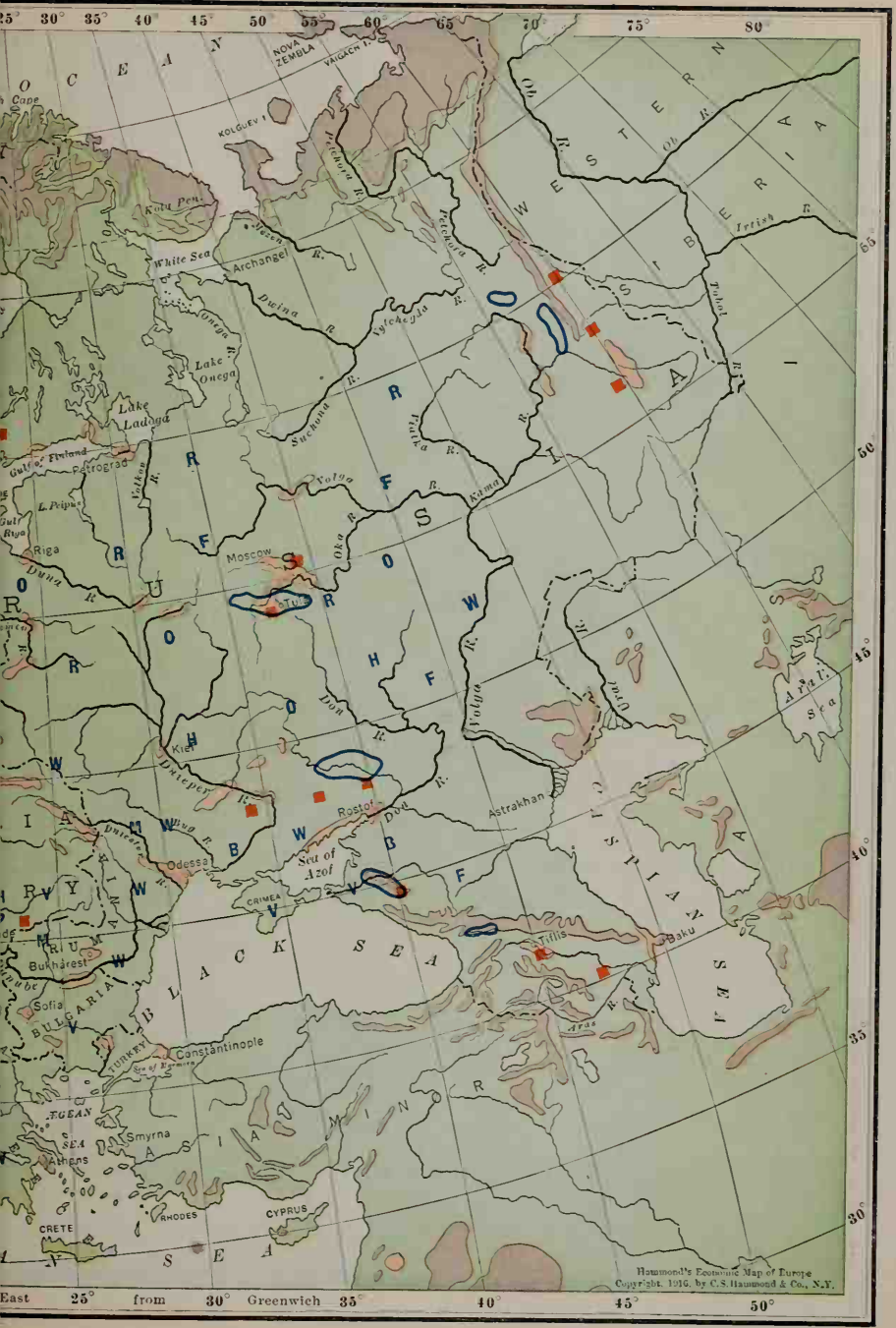
10° 5° West 0° 5° 10° 15° Longitude



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VEGETATION MAP
OF
EUROPE
SCALE OF MILES
0 100 200 300 400 500
REFERENCE
Natural Vegetation
Ice Desert, Tundra and Alpine Flora
Coniferous Forest
Broad-leaved Forest and Meadow
Evergreen Trees and Shrubs
Temperate Grasslands
Semi-desert
Desert
Oasos
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ARCTIC
ICELAND
Reikiavik
ARCTIC CIRCLE
LOFODEN IS.
FAROE IS.
SHETLAND IS.
HEBRIDES
ORKNEY IS.
BRITISH ISLES
NORTH SEA
Trondhjem
Christiania
Skagerrack
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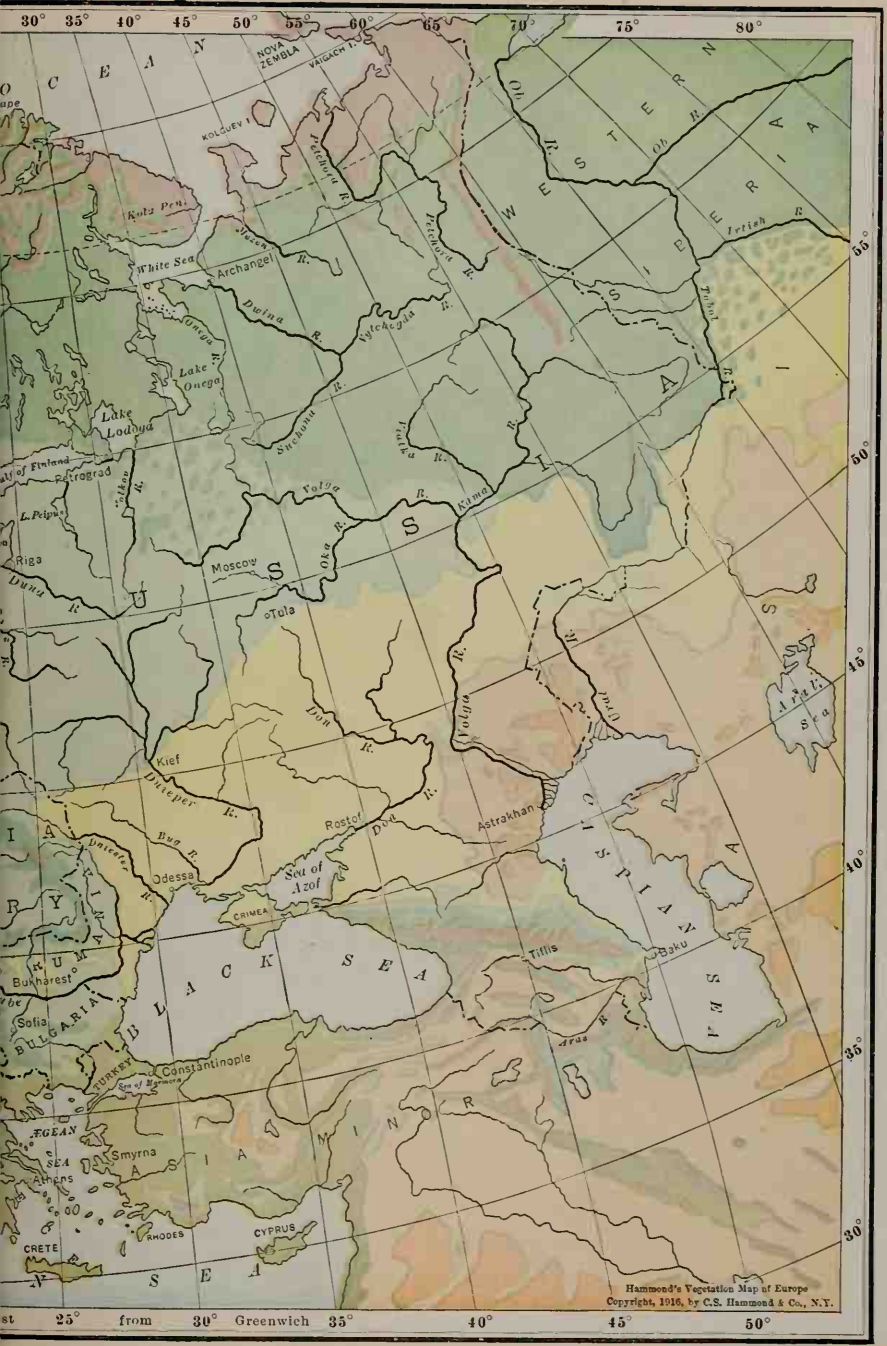
GOTLAND
OLAND
Copenhagen
BORNHOLM
Glasgow
Dundee
Edinburgh
Belfast
Irish Sea
Dublin
Liverpool
Manchester
Hull
Amsterdam
The Hague
Birmingham
London
Cork
Plymouth
Lands End
C. Clear
St. Georges Channel
Southampton
English Channel
Antwerp
Bremen
Hamburg
Berlin
Stettin
Danzig
Essen
Leipzig
Breslau
Prague
Havre
Paris
Loire R.
Bordeaux
Lyon
Vienna
Budapest
Drave
Save R.
Genoa
Marseille
Barcelona
Madrid
Valencia
Lisbon
Oporto
Douro R.
C. Finisterre
C. St. Vincent
Strait of Gibraltar
Malaga
Guadalquivir R.
Ebro R.
Rhone R.
Po R.
Tiber R.
Rome
Naples
Palermo
Messina
SICILY
C. Bon
BAY OF BISCAY
ATLANTIC OCEAN
MEDITERRANEAN
ADRIATIC SEA
BALEARIC IS.
MINORCA
MAJORCA
IVIZA
SARDINIA
CORSICA
ANDORRA
SWITZERLAND
LUXEMBURG
BELGIUM
NETHERLANDS
ENGLAND
WALES
IRELAND
SCOTLAND
NORWAY
SWEDEN
DENMARK
GERMANY
AUSTRIA
HUNGARY
ITALY
SPAIN
PORTUGAL
FRANCE
AFRICA
25° 20° 15° 10° 5° 0° 5° 10° 15°
55° 50° 45° 40° 35° 30°
10° 5° West 0° 5° 10° 15° Longitude



30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80°
NOVA ZEMBLA
VAIGACH I.
KOLGUEV I.
Kola Pen.
White Sea
Archangel
Dwina R.
Onega R.
Lake Onega
Lake Lodoga
Petrograd
L. Peipus
Riga
Duna R.
Moscow
Tula
Volga R.
Kama R.
Vyatka R.
Suchona R.
Vytchegda R.
Petchora R.
Ob R.
Irtish R.
Tobol R.
Don R.
Kief
Dnieper R.
Bug R.
Odessa
Rostof
Sea of Azof
CRIMEA
Astrakhan
Ural R.
Aral Sea
Tiflis
Baku
Aras R.
Bukharest
Sofia
BULGARIA
TURKEY
Constantinople
Sea of Marmora
ÆGEAN SEA
Smyrna
Athens
CRETE
RHODES
CYPRUS
BLACK SEA
CASPIAN SEA
ASIA MINOR
WESTERN SIBERIA
Hammond's Vegetation Map of Europe
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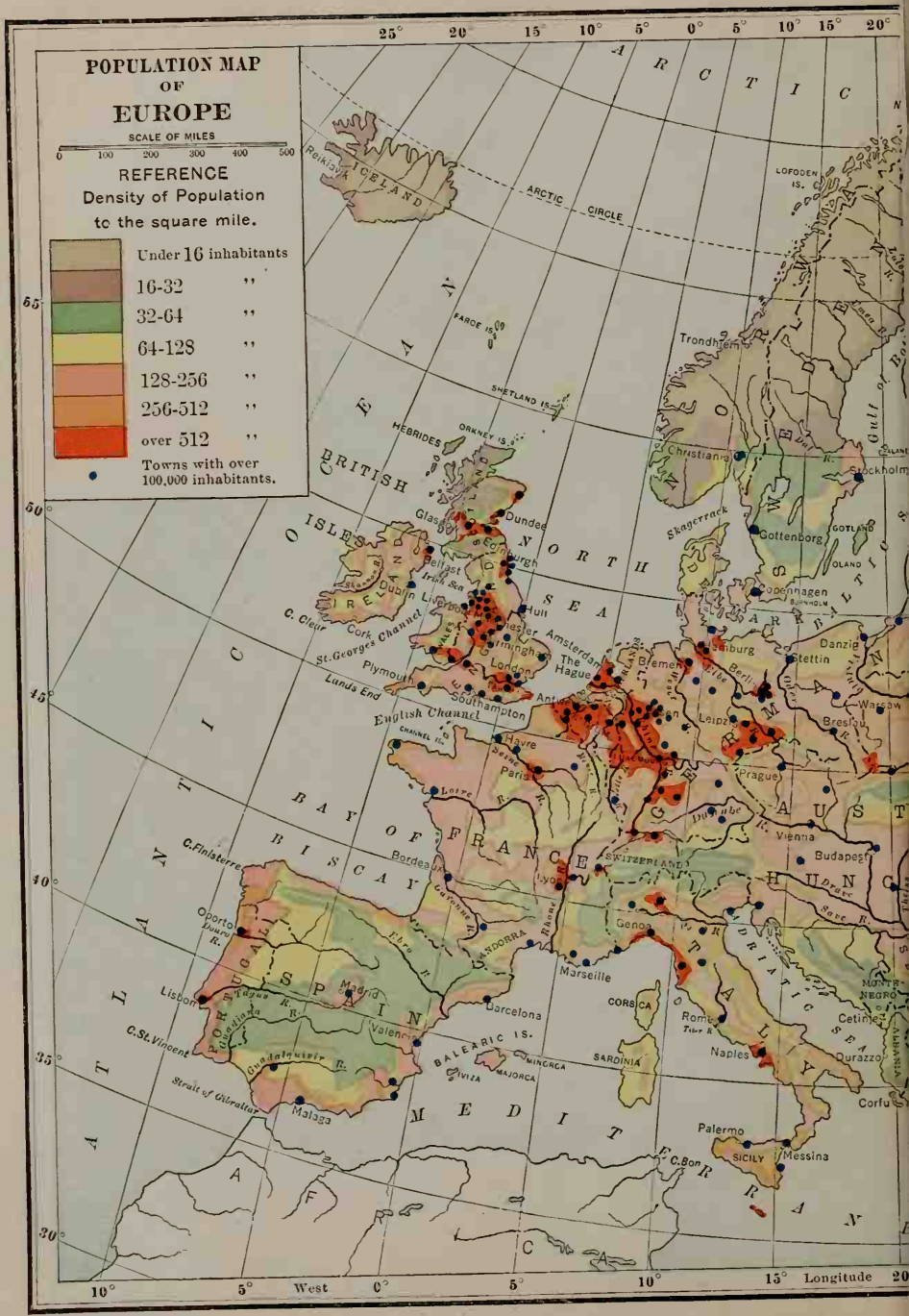
25° from 30° Greenwich 35° 40° 45° 50°


POPULATION MAP
OF
EUROPE
SCALE OF MILES
0 100 200 300 400 500
REFERENCE
Density of Population
to the square mile.
Under 16 inhabitants
16-32 ,,
32-64 ,,
64-128 ,,
128-256 ,,
256-512 ,,
over 512 ,,
Towns with over
100,000 inhabitants.
ARCTIC CIRCLE
ICELAND
Reikiavik
FAROE IS.
SHETLAND IS.
ORKNEY IS.
HEBRIDES
NORWEGIAN SEA
BRITISH ISLES
IRELAND
Dublin
Belfast
Glasgow
Edinburgh
Dundee
Hull
Liverpool
Birmingham
London
Cork
Irish Sea
St. George's Channel
C. Clear
Plymouth
Lands End
English Channel
CHANNEL IS.
NORTH SEA
Amsterdam
The Hague
Antwerp
Havre
Paris
Loire R.
Seine R.
Rhine R.
Meuse R.
Ems R.
Weser R.
Elbe R.
Oder R.
Berlin
Hamburg
Bremen
Danzig
Stettin
Warsaw
Breslau
Leipzig
Prague
Dresden
Vienna
Danube R.
Budapest
Drave R.
Save R.
Belgrade
Trondhjem
Christiania
Skagerrack
Gottenborg
GOTLAND
Copenhagen
BORNHOLM
Stockholm
LOFODEN IS.
Gulf of Bothnia
BALTIC SEA
Aland
SWEDEN
NORWAY
RUSSIA
FINLAND
ATLANTIC OCEAN
BAY OF BISCAY
C. Finisterre
Bordeaux
Garonne R.
Lyons
Rhone R.
SWITZERLAND
Geneva
Marseille
FRANCE
Oporto
Douro R.
Lisbon
Tagus R.
Madrid
Guadiana R.
Ebro R.
Pyrenees
ANDORRA
Barcelona
Valencia
SPAIN
PORTUGAL
C. St. Vincent
Guadalquivir R.
Strait of Gibraltar
Malaga
BALEARIC IS.
MINORCA
IVIZA
MAJORCA
MEDITERRANEAN SEA
CORSICA
SARDINIA
Rome
Tiber R.
Naples
ITALY
ADRIATIC SEA
Durazzo
Cetinje
MONTE NEGRO
Corfu
Palermo
SICILY
Messina
C. Bon
AFRICA
25° 20° 15° 10° 5° 0° 5° 10° 15° 20°
65°
60°
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50°
45°
40°
35°
30°
10° West 5° 0° 5° 10° 15° Longitude 20

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Copyright, 1916, by C.S. Hammond & Co., N.Y.
East 25° from 30° Greenwich 35° 40° 45° 50°
Archangel
Petrograd
Riga
Moscow
Tula
Kief
Rostov
Astrakhan
Odessa
Tiflis
Baku
Constantinople
Smyrna
Athens
Bukharest
Sofia
Lake Onega
Lake Ladoga
White Sea
Gulf of Finland
Gulf of Riga
Sea of Azof
Sea of Marmora
Kola Pen.
Kolguev I.
Nova Zembla
Vaigach I.
Petchora R.
Dwina R.
Onega R.
Volkov R.
Suchona R.
Vytchegda R.
Viatka R.
Kama R.
Volga R.
Oka R.
Don R.
Dnieper R.
Bug R.
Dniester R.
Ob R.
Irtish R.
Tobol R.
Ural R.
Aras R.
Ara'l Sea
Duna R.
Niemen R.
Danube
Rhodes
Cyprus
Crete
Turkey
Bulgaria
Rumania
Bulgaria
Black Sea
Caspian Sea
Asia Minor
Ægean Sea
Crimea
Russia
Western Siberia
Ukraine
Hungary
Austria
Ireland
Norway
Sweden
Finland
Poland
Germany
Turkey
Greece
Italy
Spain
Portugal
Ireland
Ocean
North Cape

RACIAL MAP
OF
EUROPE
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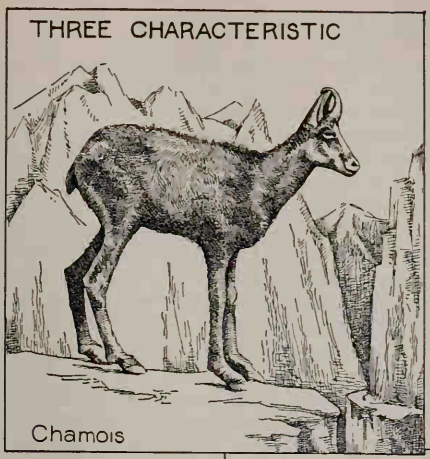
Longitude West
Longitude
East
from
Greenwich
NORWEGIANS
SCANDINAVIANS
SWEDES
Finns
Esthonians
Letts
Lithuanians
White-Russians
Great Russians
Little-Russians
Ruthenians
Little Russians
Prussians
Poles
Kassubs
Low Germans
Saxons
Middle Germans
High Germans
Franks
Frisians
Flemings
Walloons
Wends
Cheeks
Slovaks
Magyars
(Hungarians)
Rumanians
Slovenians
Croatians
Serbs
Albanians
Bulgarians
Greeks
TURKS
Cherkesses
Armenians
KURDS
CAUCASIANS
Kirgiz
Nogays
Kumiks
Tatars
IRISH
English
Erse
Welsh
ENGLISH
Bretons
North French
FRENCH
Provençals
Gascons
BASQUES
Catalans
ROMANCE
SPANIARDS
Portuguese
ITALIANS
BERBERS
Riff Berbers
SHETLAND IS.
ORKNEY IS.
HEBRIDES
ST. KILDA
CHANNEL IS.
ALAND IS.
DAGOE
OSEL
GOTLAND
OLAND
BORNHOLM
CORSICA
SARDINIA
BALEARIC ISLANDS
SICILY
MALTA
CORFU
CRETE OR CANDIA
RHODES
CYPRUS
Dublin
Edinburgh
London
Amsterdam
Brussels
Calais
Brest
Rouen
Paris
Luxemburg
Strassburg
Bordeaux
Marseille
Bilbao
Oporto
Lisbon
Madrid
Barcelona
Seville
Granada
Cadiz
Gibraltar
Algiers
Genoa
Milan
Florence
Rome
Naples
Palermo
Zara
Christiania
Stockholm
Copenhagen
Helsingfors
Petrograd
Riga
Hamburg
Berlin
Dresden
Frankfort
Prague
Vienna
Budapest
Warsaw
Czernowitz
Odessa
Bukharest
Belgrade
Sofia
Constantinople
Athens
Smyrna
Skutari
Trebizond
Moscow
Astrakhan
Tiflis
Baku
Volga R.
Oka R.
Don R.
Dnieper R.
Duna R.
Danube R.
Kama R.
Ural R.
Vyatka R.
Kur R.
Oder R.
Elbe R.
Rhine R.
Rhone R.
Loire R.
Seine R.
Po R.
Tagus R.



more potatoes and more sugar than any other continent.

Animal Life. With the advance of civilization and increasing density of population many of the large animals once found on the continent became extinct. Representative mammals that have survived are the lynx, bear, beaver, badger, otter, reindeer, elk, the Alpine chamois and marmot, the wolf (found in large packs in Poland, Hungary and Russia), the civet, fox, marten, ermine, polecat, squirrel, hare, rabbit, mole and hedgehog. Among the domestic animals the horse, pony, goat, ass, ox, mule, sheep, chicken and hog are most important. Bird life is abundant, and is represented by thrushes, finches, snow buntings, house sparrows, linnets, magpies, kingfishers, wood pigeons, canaries, eagles, falcons, owls, ravens, storks and many others. Reptiles are comparatively rare. Fish abound in the fresh and sea waters.

Mineral Wealth. Abundant stores of those minerals which are of most value to man underlie the surface of this continent, which in its total output exceeds any other grand division. Over a thousand million dollars worth of coal is usually mined each year, and iron of about half that value. In many instances these two, upon which rest so many of the industries of modern life, occur near each other, and it is impossible to estimate the extent to which the progress of the continent has been dependent upon that fact. Gold, copper, lead and zinc are also mined in considerable quantities, and Europe produces about half as much petroleum as does the United States. Of that valuable mineral, platinum, about ninety-five per cent of the entire world supply comes from the Ural Mountains, and Spain is the world's greatest producer of quicksilver. Most of the mountainous countries contain, in addition, extensive quarries of building stone, and Italy abounds in marble.

Political Divisions. Of the twenty-six states of Europe, thirteen are kingdoms. These are Great Britain, Spain, Italy, Greece, Belgium, Holland, Norway, Sweden, Denmark, Bulgaria, Serbia, Montenegro and Rumania; four are empires—Germany, Austria-Hungary, Russia and Turkey. The last-named has most of its territory in Asia, and only its capital is in Europe. Five republics are France, Switzerland, Portugal, San Marino and Andorra; and there are four principalities—Luxemburg, Albania, Monaco and Liechtenstein.

History of Europe

To give a detailed history of a great continent in a few brief paragraphs would be impossible, and it is, moreover, unnecessary, for the history of each country is given in a separate article in these volumes. But there are certain movements which have affected the continent as a whole, or a large part of it, which are worth noting here.

Ancient Times. Though the earliest civilization of Europe undoubtedly came from Asia, crossing from Phoenicia by way of the islands of the Aegean, the Greeks developed it to a point which it had never before reached. Indeed, in many respects it has never been surpassed in all the centuries that have followed. From the very first, civilization showed that trend which Bishop Berkeley described so long afterward in his famous epigram:

Westward the course of empire takes its way:

and the lands along the Mediterranean were the first in which it developed. After Greece, with its ideal of beauty—a well-rounded beauty which demanded that body, mind and the aesthetic sense be trained—came Rome, with its emphasis on strength, or power. The Romans invented no new forms of government—the Greeks had anticipated every form which Europe has since known—and they made no advance in art and little in literature; but they did excel the Greeks in their genius for organization and for the formulation of law. "Of all European history, Rome is the center," says the historian Gibbon, and it is true that a comprehension of the institutions and the political history of the later nations is impossible without a knowledge of the great work of Rome. In its most flourishing period the Roman Empire included not only Italy but Greece, Spain, Portugal, France, Switzerland, Albania, Serbia, Bulgaria, Turkey, the British Isles, Belgium, Holland, Hungary, and much of Germany, Austria and Rumania, and the unity thus established made possible that spread of Christianity which has had so great an influence on the development of Europe.

With the decline of the Roman Empire there began a troubled time—a period of migration among the northern tribes. The Saxons and Angles established themselves in Britain, the Franks in Gaul (France), the Ostrogoths and Lombards in Italy and the Visigoths in Spain.

The Medieval Period. The establishment by Charlemagne (771-814) of a great Germanic empire (see CHARLEMAGNE; HOLY ROMAN EMPIRE) which included present-day France, Switzerland, Belgium and Holland, and much of Austria, Italy and Germany, was an event of great significance, but the state which he had created did not endure beyond his time, and its breaking up was really the foundation of the kingdoms of France and Germany.

Meanwhile, the Christians of Europe had come into contact with the Saracens, enthusiasts of another faith who were attempting to sweep over Europe. Held back from Western Europe, these latter still had a weapon against the Christians in their possession of the Holy Land, and to wrest this from them the nations of Europe organized successive crusades (see CRUSADES); these failed in their primary purpose, but were of the utmost importance in acquainting Europeans with the civilization and the science of the East. In Eastern Europe the Ottoman Turks had gained foothold by capture of Adrianople in 1356, and this, together with the unsettled conditions at Constantinople, which was finally taken by the Turks in 1453, gave a strong impulse to learning in Western Europe, because it drove into exile the learned Greeks, with their store of precious manuscripts from the past.

Modern Europe. The transition from the medieval to the modern world did not occur in any definite year, but gradually, during a period extending roughly from the thirteenth to the sixteenth century. In these centuries the ideas and habits of men, their relation to the world about them and to one another, underwent a radical change. There was an awakening in almost every department of life. A great revival of art and letters occurred. The printing press was invented; America was discovered in 1492; the Reformation made men's minds alive to religion and laid the foundation for a new type of intellectual freedom. First one nation, then another, held first rank in Europe; Spain, then France, then England became prominent, and in the meantime two new states, Prussia and Russia, were increasing their strength and territory. Nothing in all history is more interesting than the accounts of the beginnings of all these modern states—the struggles through which they found themselves.

By the end of the eighteenth century most of them were fairly well established, but the struggles continued. There was the French Revolution (which see), which involved all

Europe and brought about the dissolution of the old Holy Roman Empire; the establishment of Greek independence; the disappearance of Poland as a separate state; the division of Holland and Belgium into two states; the unification of Italy, brought about largely through the genius of Cavour; the work of Bismarck and the Franco-German War, which resulted in the consolidation of the German states into an empire, and the establishment of the third republic in France; the war of 1897 between Turkey and Greece; the Spanish-American War, which left Spain almost without colonies; the South-African War, by which the interests of England in South Africa were greatly advanced; the Russo-Japanese War, which brought to a close the domination of Russia in Manchuria and elsewhere in the Far East, and showed the nations of Europe that Japan was a power to be reckoned with; the insurrection of the Young Turks and the deposition of Abdul-Hamid; the annexation of Bosnia and Herzegovina to Austria, and the Balkan Wars, by which Turkey lost practically all of its territory in Europe.

It seemed, at the opening of the second decade of the twentieth century, as if peace among the great powers were secure. Several of them, notably Germany, France, Russia and Great Britain, were constantly adding to their armies and navies, but it was contended that that fact lessened rather than increased the chance of war. But in the summer of 1914 there broke out a conflict which dwarfed all others the world has ever seen. This is rightly called the War of the Nations, for nearly every state in Europe became directly concerned in it. What its outcome will be, what readjustments it will make, it is impossible now to predict, but one thing is certain: it will be many years, perhaps generations, before Europe recovers from its devastating effects. Agriculture, industries, commerce, art, literature—all suffered; while in every country involved the very strongest and ablest men fell. Over two million had been killed on the field of battle before the end of 1916, and more than three times that number had been so seriously wounded that they will be entire or partial charges on society the remainder of their lives. This most terrible of all conflicts is described in the article WAR OF THE NATIONS. W.E.L.

Consult, for history, Freeman's *Historical Geography of Europe;* Ogg's *The Governments of Europe.* For physical features, Mill's *International Geography;* Suess's *The Face of the Earth.* For books on various parts of Europe, see articles dealing with the several countries.

Related Subjects. The articles in these volumes relating to Europe are very numerous, and not all of them can be given here. The articles on cities and towns, on products, and on history, for instance, will be found listed in the indexes accompanying the articles on the various political divisions. The more general topics are here listed and classified:

COAST WATERS

Adriatic Sea	Caspian Sea
Aegean Sea	Cattegat
Arctic Lands and Seas	Dardanelles
Atlantic Ocean	English Channel
Azov, Sea of	Gibraltar, Strait of
Baltic Sea	Marmora, Sea of
Biscay, Bay of	Mediterranean Sea
Black Sea	North Sea
Bosporus	Skagerrak
Bothnia, Gulf of	White Sea

LAKES

Avernus	Lugano, Lake
Constance, Lake	Maggiore, Lake
Geneva, Lake	Neuchâtel, Lake of
Ladoga, Lake	Onega, Lake
Lucerne, Lake of	Zurich, Lake

MOUNTAINS

Alps	Matterhorn
Apennines	Mont Blanc
Balkan Peninsula	Olympus
Black Forest	Parnassus
Carpathian	Pyrenees
Caucasus	Riesengebirge
Cenis, Mont	Rosa, Monte
Cevennes	Saint Gotthard
Harz	Sierra Nevada
Helicon	Ural
Jungfrau	Valdai Hills
Jura	Vosges

PEOPLES

Angles	Magyars
Anglo-Saxons	Races of Men
Basque	Ruthenians
Celts	Samnites
Czech	Slavs
Gael	Slovaks
Gypsy	Tartars
Jutes	Teutonic Races
Letts	Turanian

POLITICAL DIVISIONS

Albania	Italy
Alsace-Lorraine	Lapland
Andorra	Liechtenstein
Austria	Lithuania
Austria-Hungary	Luxemburg
Belgium	Monaco
Bulgaria	Montenegro
Denmark	Netherlands, The
England	Norway
Finland	Poland
Flanders	Portugal
France	Prussia
Germany	Rumania
Great Britain	Rumelia
Greece	Russia
Hungary	San Marino
Ireland	Scandinavia

OUTLINE AND QUESTIONS ON EUROPE

Outline

I. Location

(1) Latitude, 36° to 70° 11′ north
(2) Longitude, 9° 27′ west to 66° 21′ east
(3) Relation to Asia

II. Size and Shape

(1) Smallest of continents except Australia
(2) Greatest length, north and south, about 2,400 miles
(3) Greatest breadth, east and west, 3,293 miles
(4) Area
  (a) Actual
  (b) Comparative
(5) Triangular shape
(6) Closeness of most parts to sea

III. Physical Features

(1) Coast waters
  (a) Length of shore line
  (b) Importance of coast waters
(2) Surface relief
  (a) General trend of mountains and lowlands
  (b) Absence of extremes in heights and depressions
  (c) Chief mountain systems
    1. Effect of mountainous character on history of Southern Europe
    2. The northern highland region
  (d) The great plain
    1. Vast importance
(3) Waters
  (a) Rivers
  (b) Position of watershed
  (c) Lakes

IV. Climate

(1) Only continent which does not extend into tropics
  (a) Comparative mildness of climate
    1. Effect of closeness to sea
  (b) Greater extremes in Russia
(2) Absence of deserts
  (a) Slight necessity for irrigation

V. Vegetable and Animal Life

(1) Widespread vegetation
(2) Zones of forest trees
  (a) Northern cone-bearers
  (b) Oak and beech woods in central part
  (c) Olive characteristic of south
  (d) Agricultural products in which Europe excels
(3) Characteristic animals

VI. Mineral Resources

(1) Continent ranks first in total mineral output
(2) Chief products

VII. The People

(1) No European race
(2) Most of the people Caucasian
(3) The Mongolians
  (a) Magyars
  (b) Finns
  (c) Bulgarians
  (d) Turks
(4) Differences in physical characteristics
(5) Languages
  (a) About sixty different languages spoken in Europe
  (b) Division according to language groups
(6) Religion
  (a) Predominance of Christianity
    1. Three great branches
  (b) Other faiths

VIII. Political Divisions

(1) Kingdoms
(2) Empires
(3) Republics
(4) Principalities

IX. History

(1) Importance of Europe in world's history
  (a) Not the seat of oldest civilization
  (b) Only continent whose people have been progressive
(2) Westward trend of civilization
  (a) The contribution of Greece
  (b) The great importance of Rome
  (c) The western nations
(3) Medieval Europe
  (a) Charlemagne
  (b) Crusades
  (c) Fall of Constantinople
(4) The modern period
  (a) Renaissance
  (b) Reformation
  (c) Inventions and discoveries
  (d) Rise of new kingdoms
  (e) Nineteenth-century readjustments
  (f) The War of the Nations

Outline and Questions on Europe—Continued

Questions

About how many people are there in Europe who are racially connected with the Chinese?

Where do they live?

If there had been no mountains in Southern Europe, how might the history of that region have been different?

How does Europe rank among the continents as regards its production of wheat? Of sugar?

How did the entry of the Turks into the continent actually bring about intellectual benefits?

What is indicated by the difference in the shape of the heads of various European peoples?

In what general way does Europe resemble North America in its relief features? In what way do the two differ?

Is irrigation of as much importance in Europe as in North America?

What part did Charlemagne play in the upbuilding of two of the great states of modern Europe?

What did the ancient Greeks believe was the origin of their ancestors? What connection had this belief with the story of Cadmus?

In what way have the coast waters affected the history of this continent?

What are the relative latitudes of Pittsburgh and Naples? Why is the climate of the latter so much less severe?

In what sense can it be said truly that "Of all European history, Rome is the center"?

If North America were as densely settled as Europe, how would its population compare with its present population?

How does the coastline of Europe compare in length with that of Africa? How do the two continents compare in area?

What is a "continental climate"? Why is this type to be found in Russia and not elsewhere in Europe?

What was the great ideal of Greece? Of Rome?

Since the earliest civilizations did not grow up in Europe, why should that continent be considered the most important in the world's history?

How large a proportion of the inhabitants of the continent do not hold any Christian faith?

What is the longest river of Europe? How does it compare in length with the longest river of North America? Of South America?

Divide the countries of Europe into groups according to their form of government.

With what justice is the War of the Nations called the greatest conflict in the history of the world?

What does the name *Europe* mean? With what other continent name is it in contrast?

Name at least three important events or discoveries that marked the change from the medieval to the modern period.

In what relationship does Europe stand, geographically, to Asia? Is the idea that they are two continents an ancient or a modern one?

Scotland	Sweden
Serbia	Switzerland
Spain	Turkey

RIVERS

Adige	Oder
Arno	Po
Danube	Rhine
Dnieper	Rhone
Dniester	Rubicon
Don	Saône
Elbe	Save
Garonne	Scheldt
Loire	Seine
Main	Somme
Marne	Tiber
Meuse	Ural
Moselle	Vistula
Neva	Volga

EURYDICE, *u rid' i see,* in Greek mythology, was the wife of Orpheus. After her death from the bite of a serpent, her husband descended into Hades and so charmed Pluto with the music of his lyre that he was permitted to take Eurydice back to earth, on condition, however, that he should precede her on the way to the upper regions and that he should not look behind him. Orpheus, yielding to his natural anxiety, disobeyed this latter injunction, and Eurydice was drawn back into the infernal regions. There is no possible connection between this story and the Bible narrative of Lot's wife, although there is a popular belief to that effect. The tales simply happen to run parallel, so far as is known. A beautiful version of the legend is found in Vergil's *Georgics.* Eurydice and Orpheus are frequently represented in Greek art.

EUSTACHIO, *a oos tah' kyo,* BARTOLOMMEO (? -1576), an Italian surgeon who was one of the founders of modern anatomy. He is particularly famed as the discoverer of the Eustachian tube in the ear, which was named for him

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EVANGELINE: A PLAN FOR STU

The following outline may well serve as a model for similar study poems which are commonly read in school. *Evangeline* has been cho is such a general favorite.

OUTLINE OF THE POEM

Introduction. This not only gives the background, the forest prin the reader that the story which follows is a sad one. Which lines ind

Part the First

I.

(1) "The little village of Grand-Pre" described.
(2) Description of Evangeline.
(3) Her home.
(4) Her accepted lover.

II.

(1) The coming of winter.
(2) The visit of Gabriel and his father to Evangeline's home.
(3) First mention of the English ships.

III.

(1) The notary comes to draw up the marriage contract.
(2) He tells his story of justice.
(3) The drawing of the contract.
(4) The last peaceful evening.

IV.

(1) The feast of betrothal.
(2) The gathering at the church.
(3) The deportation proclaimed.
(4) "Strife and tumult of angry contention."
(5) The rebuke of Father Felician.
(6) Dismay in the village.

V.

(1) The deportation.
(2) Evangeline and Gabriel separated.
(3) The blazing village.
(4) Death and burial of Benedict.

Part the Seco

I.

(1) The Acadians, "scatter snow."
(2) Rumors of Gabriel.
(3) Beginning of the long s

II.

(1) The voyage down the M
(2) Gabriel's boat passes raft of the Acadians

III.

(1) Basil the herdsman.
(2) Meeting of Evangeline
(3) "Gone? is Gabriel gone
(4) The joyous feast of the dians.
(5) The "olden memories"
(6) Evangeline and Basi search for Gabriel.

IV.

(1) The journey into the Oz
(2) The sympathy of the In
(3) The Jesuit Mission.
(4) "Evangeline stayed at
(5) "Yet Gabriel came not.
(6) The long search contin

V.

(1) The search relinquished
(2) Evangeline joins the Si
(3) The city in the grip of
(4) Evangeline's visits to th
(5) She sees Gabriel, dying
(6) The farewell.

had considered weaving a novel about it; feeling, however, that it was better suited to poetic treatment, he offered it to Longfellow, who made of it an exquisite idyl. The meter chosen was that of the classic epics, the *Iliad* and the *Aeneid,* and the lines are long and stately. Some of them, as the opening ones, for instance, are as familiar as any lines in the English language:

This is the forest primeval. The murmuring pines and the hemlocks,
Bearded with moss, and in garments green, indistinct in the twilight,
Stand like Druids of eld, with voices sad and prophetic,
Stand like harpers hoar, with beards that rest on their bosoms,

The pathos of Evangeline's search for Gabriel through many hundreds of miles of forest and city, down river and bayou, and of her final discovery of him on his deathbed rings true and is never strained. Many a line is worth remembering for its true poetic quality, as—

When she had passed, it seemed like the ceasing of exquisite music.

Silently one by one, in the infinite meadows of heaven,
Blossomed the lovely stars, the forget-me-nots of the angels.

EVANS, Mary Ann or Marian. See Eliot, George.

EVANS, Robley Dunglison (1846-1912), an American naval officer, who was known by the popular name, "Fighting Bob." The boy who was to become Rear-Admiral Evans was born in Virginia and was appointed to the United States Naval Academy in 1860. At the age of seventeen, he, a Virginian, was a midshipman in the United States navy, while his brother fought on the side of the Confederacy.

ROBLEY D. EVANS

In 1868 Evans was commissioned lieutenant-commander; in 1870-1871 he was on duty at the navy yard at Washington, and in 1871-1872 at the Naval Academy at Annapolis. He was made commander in 1878, in 1891 was in command of the *Yorktown* at Valparaiso, Chile, and in 1893 became a captain. During the Spanish-American War Evans was in command of the *Iowa,* and at the naval Battle of Santiago took an important part in the destruction of Cervera's fleet. He was commissioned rear-admiral in 1901, and in 1902 was made commander of the Asiatic fleet, with the *Kentucky* for his flagship.

Although the nickname "Fighting Bob" was merited early in his career, it was not given to him until 1891, when he was sent to Valparaiso in command of the *Yorktown* to help Captain Schley in a fight which the latter's men got into with the Chileans. During the absence of the *Baltimore,* Evans with his single gunboat confronted the ten forts and the whole Chilean squadron, and twice cowed the Chileans with the threat to open fire, thus saving his flag from insult and preventing the forcible seizure of the American refugees.

When President Roosevelt sent the American battle fleet around the world on a mission of peace and good will, Rear-Admiral Evans commanded it around Cape Horn and up the Pacific coast to California, when he relinquished his duties, having reached the age of retirement, sixty-two years.

EVANSTON, *ev'anz tun,* Ill., a residential city of Cook County, one of the most beautiful suburbs of Chicago, situated twelve miles north of the center of that city, along the shore of Lake Michigan. The population in 1910 was 24,978; in 1916 it was estimated to be 28,591. It is served by the Chicago & North Western and the Chicago, Milwaukee & Saint Paul railroads, and is connected with Milwaukee by an electric line, and with Chicago by elevated and surface lines.

Evanston is a city of wide, beautifully-shaded streets, attractive homes and churches and well-known educational institutions. It is the seat of Northwestern University (which see), attended by over 5,000 students, and the largest Methodist Episcopal school in the United States, and of three affiliated schools, the Garrett Biblical Institute, the Norwegian Danish Theological School and the Swedish Theological Seminary. Winchell Academy, the Convent of Visitation and the Cumnock School of Oratory, the latter affiliated with the university, are also located here. The Willard Rest Cottage is the headquarters of the National Woman's Christian Temperance Union; the city was the home of the founder of the organization, Frances E. Willard.

Evanston was incorporated as a town in 1863 and as a village in 1872, and received a city charter in 1892. The water and filtration plant is owned by the city.

EVANSVILLE, *ev'anz vil,* IND., the county seat of Vanderburgh County and an important manufacturing center, on the Ohio River. It is the second largest city in the state, ranking next to Indianapolis. In 1910 the population was 69,647 and in 1916 it was estimated to be 76,078. The city is in the southwestern corner of the state, 150 miles directly southwest of Indianapolis, 163 miles east by south of Saint Louis, Mo., and 155 miles by rail and 200 miles by the river west of Louisville, Ky.

Evansville is on six trunk lines—the Chicago & Eastern Illinois; the Cleveland, Cincinnati, Chicago & Saint Louis; the Southern; the Louisville & Nashville; the Illinois Central and the Evansville & Indianapolis railroads—and is the terminus of several interurban electric roads. Two belt lines connect the industrial plants of the town with all of the railroads. Six steamboat lines make Evansville their home port.

Within the city limits there are five soft-coal mines, and within a radius of fifty miles there are about sixty such mines. This advantage, together with the shipping facilities to points north, south, east and west, by rail and river, and abundant water power furnished by a $2,000,000 government dam above the city, gives the place great importance as a shipping and manufacturing center. There are 400 factories, employing 12,000 workers. Evansville is a great wheat market and the second largest hardwood lumber market in the world; its saw mills cut and ship lumber, notably Indiana quartered oak, to all parts of the United States and Europe. The largest industrial enterprises are manufactories of furniture.

The prominent buildings are a courthouse (the largest in the state), a customhouse, city hall, United States Marine Hospital, a state hospital for the insane, the Elks' Home, Saint Mary's and Deaconess hospitals, three Carnegie libraries, the Willard Public Library and the Little Sisters' Home for the Aged. In 1916 a fund was secured by county bonds and popular subscription for the erection of a Coliseum costing $150,000.

Evansville was founded in 1816 by General Robert M. Evans. It was incorporated as a city in 1847 and reincorporated in 1905. The completion of the Wabash and Erie Canal in 1853, from Evansville to Toledo, Ohio, a distance of 400 miles, contributed greatly to the growth of the city. Evansville is built too high above the river to suffer from the occasional overflows of the Ohio.

EVAPORATION, *e vap o ra'shun.* When water is left standing in an open dish in a warm room it soon "dries up"; damp clothes hung on a line in the sunshine lose all their moisture in a short time. The water in them is changed to vapor by the heat in the atmosphere, and the warmer and drier the surrounding air the more rapidly this process, called *evaporation,* takes place. With a high temperature there may be a great deal of vapor in the air; for instance, at 90° there may be almost twice as much as at 70°. At freezing point there is very little, but a certain amount of moisture must always be in the atmosphere, for no living thing could exist in perfectly dry air. When all the vapor that can exist at a particular temperature is present, the air is *saturated,* or at *dew-point,* but this seldom happens except when it is raining. Evaporation takes place at any temperature from the surface of a liquid, for even ice and snow send off vapor, which is especially noticeable on a day after a snowstorm when the temperature rises suddenly.

Air containing much moisture is said to be *humid,* although as a general thing the amount is much less than that required for *saturation.* The extent of this humid condition, or *humidity,* in tropical regions is very great, especially near the sea, while in cooler climates it is much less. A person can withstand a great deal more cold in air which contains very little vapor; this explains why cold winds blowing over water seem more penetrating than winds farther inland in the same temperature. Without water, plants and animals cannot live, and large areas would be uninhabitable if it were not for rain produced by the water which evaporates from the oceans, lakes, rivers, ponds and moist earth.

The humidity in the air is often shown by clouds. If they form rapidly, or if small patches of cloud increase rapidly in size, the humidity is increasing; while if the cloud area is becoming smaller, it is highly probable that the air is becoming drier. The moisture which plants absorb through their roots evaporates mainly through the leaves, and in them the process is called *transpiration* (see LEAVES). The more leaf surface exposed, the more rapid will be the transpiration, but the structure of the leaf, as in the pine needle, often prevents very rapid transpiration. In other cases the amount of water which evaporates is immense, as in a beech tree 110 years old, which was estimated as transpiring 2,250 gallons in one summer.

Other liquids, such as ether, ammonia and alcohol, evaporate more rapidly than water, leaving their surfaces very cold. It is on this principle that ammonia is used in cold storage plants (see COLD STORAGE). C.R.M.

EVARTS, *ev'arts,* WILLIAM MAXWELL (1818-1901), an American statesman, lawyer and orator of high rank. He was graduated at Yale in 1837, studied law at Harvard, and was admitted to the bar in New York City in 1841. From July, 1868, until March, 1869, he was Attorney-General of the United States; in 1872, counsel for the United States in the *Alabama* claims arbitration. Previously he had won a high reputation as chief counsel for President Johnson in his impeachment trial. During President Hayes's administration he was Secretary of State. Evarts was elected to the United States Senate from New York in 1885 and served until 1891, when he retired to private life.

EVENING SCHOOLS. See SCHOOLS, subtitle *Public Schools.*

EVENING STAR, HESPERUS, or VESPER, the name given to the planet Venus, which appears as the first star of evening when it is on the east of the sun and as the last star of the morning when it is on the west. When Venus becomes the morning star its position as evening star is occupied in turn by Mars, Jupiter and Saturn. The term *evening star* is now popularly and vaguely applied to any bright planet showing above the horizon early in the evening.

VIEWING THE SUMMIT OF EVEREST

EV'EREST, MOUNT, the highest peak in the world, in the Himalaya range on the frontiers of Tibet and Nepal, north of British India. It rises to a height of 29,002 feet above sea level, a distance of approximately five and a half miles. The mountain has no distinctive native name, but it received the present name in honor of Sir George Everest, surveyor-general of India, who ascertained its height in 1841. Many adventurous mountain-climbing scientists have endeavored to reach the summit of this giant among peaks, but no one has accomplished the feat. (For comparison of the height of Mount Everest with the highest mountains on the moon, see MOON.)

EVERETT, *ev'er et,* EDWARD (1794-1865), an American statesman and author, and one of the greatest orators of his day. He was born at Dorchester, Mass., and received his education in Boston and at Harvard College. He entered the Unitarian ministry at the age of nineteen, but resigned his first pastorate in less than two years. After traveling in Germany and England, he occupied the chair of Greek literature at Harvard College. For four years he was editor of the *North American Review;* then, entering politics, he served five terms in Congress and was elected governor of Massachusetts in 1835. He filled the office of governor for four terms, and was then defeated for reëlection by a single vote.

EDWARD EVERETT

In 1841 Everett was named United States minister to Great Britain, but immediately after Polk's inauguration he was recalled. From January, 1846, to 1849, he was president of Harvard College, and in 1852 became Secretary of State in President Fillmore's Cabinet. Within a few months he was elected United States Senator from Massachusetts, but resigned in 1854. The Constitutional Union party nominated Everett for Vice-President in 1860, but his ticket received only thirty-nine electoral votes out of 303.

It was Everett who was the chief orator at Gettysburg on the day Lincoln delivered his great speech of 279 words. Everett was so amazed at the President's logic and power of condensation that he declared Lincoln's speech would live generations after his own (Everett's) two-hour effort was forgotten.

EVERETT, Mass., a manufacturing city in Middlesex County, situated on the Mystic River, three and one-half miles north of Boston, of which it is a suburb. The Boston & Maine and the Boston & Albany railroads serve the city, and interurban lines connect with Boston, Chelsea, Salem, Lynn and Malden. There are excellent freight facilities by rail and by water. Everett was settled in 1640 and was a part of Malden (being known as South Malden) until 1870, when it was incorporated as a township. In 1892 it was chartered as a city. In 1916 its population was 39,233.

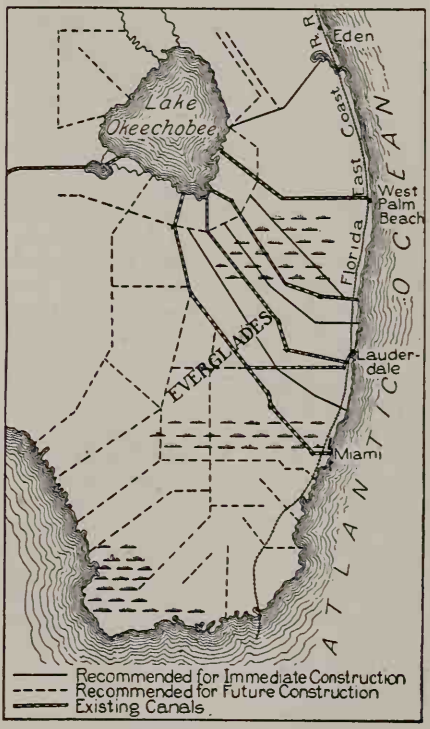
Although Everett is a manufacturing city of importance, it is also an attractive city of homes, for it is within the scope of the boulevard system known as the Metropolitan Parkway, and many Boston merchants have their residences there. It has the Parlin and Shute libraries, the Whidden Memorial Hospital and the Home School for young ladies. Of the varied industries for which the city is noted, the production of gas and coke is in the foremost rank, the coal used being brought from mines in Nova Scotia. L.P.S.

EVERETT, Wash., the county seat of Snohomish County, situated on Puget Sound, at the mouth of the Snohomish River, thirty-three miles north of Seattle. It is served by the Chicago, Milwaukee & Saint Paul, the Great Northern and the Northern Pacific railroads, by electric interurban lines and by steamboats. The population, which in 1910 was 24,814, was estimated to be 35,486 in 1916.

Everett is in a region of extensive pine forests, and lumbering is the chief industry. Here are located some of the largest saw mills in the Northwest. Quantities of red-cedar shingles are exported. Gardening and farming, and the mining of copper, gold and silver are other large interests of the surrounding country. The city has shipyards; ore, paper and flour mills; iron works, sash and door factories, and smelters. In connection with the last is one of the two plants in the United States for the saving of arsenic from smelter fumes. Everett has an excellent harbor, equipped with several iron piers, and has a considerable commerce.

The town was not settled until 1891, but its location, on the Sound and in the great forests, and its railroads contributed to a rapid growth. It was incorporated in 1893 and has since adopted the commission form of government. It contains United States customs and assayer's offices, a Carnegie Library, Y. M. C. A. building, a Lutheran college and two hospitals.

EVERGLADES, *ev'er glayds,* a name commonly given to any swampy, grass-covered area, but applied particularly to a vast, marshy tract in Southern Florida, covering an area about 140 miles long and fifty miles broad.



THE EVERGLADES

The map shows the ambitious plans of Florida for reclaiming at least a part of the area.

Until recently there had been no effort to drain and reclaim this area, larger than some Eastern states of America; but a most remarkable drainage project has now been successfully inaugurated by which thousands of acres of land have already been reclaimed in this district. In many places where there was in 1913 nothing but marsh, lakes and pools, excellent crops of fruit and vegetables are now grown.

The water which caused the formation of the Everglades came from Lake Okeechobee, and from the heavy rains which fall from May to October. The marshy lands were covered to a depth of six feet over much of the area, and nowhere were they habitable. In 1913, five drainage canals had been dug through the

swamp to the Caloosahatchee River, and the higher portions of the land were rendered fit for occupation and agriculture. A total area of 5,000 square miles may eventually be reclaimed, the state of Florida in 1913 having appropriated $6,000,000 for this purpose.

The Seminole Indians, after their subjection in 1842, fled towards the Everglades and for many years were the only inhabitants of what was until recently a most unhealthful and inhospitable region.

Consult *The Everglades of Florida*, a document (No. 89) of the United States Senate, which may be secured from the Government Printing Office, Washington; also, Rhodes and Dumont's *A Guide to Florida*.

EV'ERGREEN, any plant, shrub or tree which wears a dress of green all the year. Deciduous trees (which see) drop all their leaves at a definite season each year, and stand for months bare skeletons of trunk, branches and limbs. Evergreens, however, do not shed old leaves until new ones have formed, so their change of garment is not noticeable; the new leaves push off the old. The leaves of evergreen trees, being called upon to bear exposure to frost, cold and drying winds, are more tough and leathery than leaves of other trees, and, as in the cone-bearing trees (which see), the leaves are needlelike. Needle leaves have less leaf surface exposed than have broad leaves, and thus can more easily resist changes of temperature. They also have abundant green tissue (see CHLOROPHYLL) to absorb life-giving properties.

In warm climates many evergreens keep their leaves for several years. Some of the best known evergreens are those which serve so well and last so long in interior decoration—pines and firs, holly, ivy, box and myrtle. Rhododendrons, some magnolias, and most tropical plants are evergreens. Some of the evergreens, the pines, especially, are among the most valuable timber trees in the world.

EVERLASTING FLOWER, a name applied to various flowers which when picked and dried can be kept for an indefinite time without much change in their appearance. The French call them *immortelles*, and that name is now given in America to flowers of that nature used in wreaths to be placed on graves. See AMARANTH; IMMORTELLE.

EV'IDENCE. Those things which tend to prove the truth or falsity of a fact at issue the basis of all legal trials, whether civil or criminal. Testimony, which is the written or spoken declaration of a witness, is only one kind of evidence. Objects which may be inspected by the judge or jury—as, for instance, documents or weapons—may also be evidence. There is almost general agreement as to what constitutes evidence and what kind of evidence is permissible.

It is the business of a judge to decide what evidence is admissible in a case, and frequently much of the time in a trial is occupied by the efforts of opposing lawyers to have certain evidence admitted or excluded. The first requirement of evidence is that it shall have a direct bearing on the question at issue. Sometimes this leads to strange situations. For instance, if a prisoner is charged with stealing a *black* horse, no evidence will be admitted to prove that he took one of another color. *Hearsay* evidence, the statements of one party as to what he heard another say, is legal only in a few special instances. *Oral* evidence cannot as a rule contradict that of documents. *Confessions of guilt* are not admissible as evidence if made with the hope of reward or the fear of punishment.

Prima-facie evidence, or evidence as shown on the face of things, is that which at first view seems to be conclusive, but may be contradicted. Thus the books of original entry of a bookkeeper are evidence that certain sums have been handled in a certain manner, unless other evidence proves them wrong.

Circumstantial Evidence. If the thumb mark of a certain man is found on pieces of counterfeit paper money it is evidence of the circumstance that it has been in his possession, but not necessarily that he has been guilty of passing counterfeit money. Such evidence is called *circumstantial* because, while the crime is to be presumed, nothing direct is conclusively proved. When circumstantial evidence points without reasonable doubt to the commission of a crime a jury is bound to act upon it as though it were *direct* proof. It is the business of the judge to *charge* or instruct the jury what verdict it is entitled to reach from a consideration of the evidence.

EVOLUTION, *ev o lu'shun*, a word once employed in connection with such a simple process as the development or unfolding of a flower. Since the time of Herbert Spencer (which see) it has taken on a different meaning. As commonly used, the term implies the descent of the complex life-forms of to-day from the simpler ones of ages gone. Incredibly slow has been the process, incredibly long

the stretches of time; but somehow, everything that exists to-day has grown out of what existed earlier, just as what is to come must grow out of what exists to-day.

Evolution, then, is simply a process of change through unimaginable periods of time, a change always from the simpler to the more complex. An example or two will make this clear. One of the most useful animals in the world is the horse, and the breeder knows how to take advantage of the laws of heredity to increase this usefulness. If great strength is wanted, or endurance, or fleetness, he can select any one of these characteristics. Geologists have learned that Nature has been at work since before the existence of man, breeding changes in just this manner. Embedded in rocks in various places have been found fossils which show all the steps in this breeding process. The earliest horse bore a certain resemblance in general form to the horse of to-day, but it was little larger than a dog, and it had five toes. Gradually, through the ages, the horses that were largest and strongest tended to live and reproduce, while the smaller, feeble ones died; and so the horse became, little by little, a larger animal. In like manner the toes, because for some good reason they did not help to fit the horse for its environment, were in time replaced by the solid hoof; it is a fact, discovered by geologists and biologists in their study of thousands of instances, that those characteristics which aid an animal in its struggle for existence tend to persist and be strengthened, while those which hinder are gradually eliminated.

Birds and Reptiles. Another very interesting example of this wonderful process of change is to be found in these two widely differing forms of life. That is, they seem to any but the closest student to differ widely, but the biologist knows that there are structural resemblances which prove them closely akin, and the geologist can show in his fossils the connecting forms (see Fossil). The reptiles came first, but gradually some reptiles acquired embryo wings, and these were developed in succeeding generations until they became the distinguishing mark of a new order of animals. In the consideration of any such development the time element cannot be too strongly insisted upon. It is a great task which the evolutionist puts on a man's powers of faith when he asks him to believe that all the life-forms of to-day—even man, with his varied activities and his spiritual aspirations—have evolved from such primitive forms as now exist in the amoeba or the hydra (both of which see); but he allows scores of millions of years for the process.

"Descent of Man." It is of interest to know that birds developed from reptiles, but man is far more vitally concerned with the question of his own origin. Darwin, whose name in the popular mind is inseparably linked with the doctrine of evolution, did not hesitate to declare that man and the manlike apes had a common ancestor, and to-day practically every scientist accepts that theory without question. The nonsense verse beloved of children is not only a nonsense verse—it states an acknowledged truth:

> Children, behold the chimpanzee:
> He sits on the ancestral tree
> From which we sprang in ages gone.
> I'm glad we sprang; had we held on
> We might, for aught that I can say,
> Be horrid chimpanzees to-day.

But the series between man and the apes was not complete, and the search for the "missing link" attracted much attention. The fossil remains of primitive men showed that in those far-off days men were in structure, and especially in size of brain cavity, more closely related to the apes than are the men of to-day, but still they were men and not apes. At length, in Java, there were found the fossil remains of an animal which the scientists scarce knew whether to consider man or ape; there developed a general scientific agreement that the missing link had been discovered.

Recent poets, alive to great world-interests, have found in the doctrines of evolution material more fascinating than that afforded by medieval romances, and have dealt with this material in various ways. An American poet, William Vaughn Moody, has conceived of all life as moved from the beginning by—

> A vision, a command, a fatal word:
> The name of *man* was uttered, and they heard.
>
> Upward along the aeons of old war
> They sought him; wing and claw-bone, shank and bill,
> Were fashioned and rejected; wide and far
> They roamed the twilight jungles of their will,
> But still they sought him, and desired him still.

The Religious Objection. There are those of the Christian faith who insist that a belief in evolution and a belief in the Bible cannot go hand in hand. There are others who contend that it implies no lessening of the Creator's powers to state that He worked through such an orderly process as evolution in His

fashioning of the world, instead of performing a series of distinct, more or less unrelated, acts of creation. Not even the most enthusiastic supporter of the doctrine of evolution believes that the whole story is told in such terms as "adaptation," "natural selection," or "survival of the fittest." There is a phase of the question which science has been unable to grasp, a controlling or modifying cause which has never been discovered; and the theory in its entirety no more denies the existence of a Deity than does the strictest form of revealed religion. A.M C C.

Consult Darwin's *The Origin of Species;* also *Descent of Man,* by the same author; Spencer's *Principles of Biology;* Crampton's *The Doctrine of Evolution.*

EVOLUTION, meaning literally, *unfolding* or *unrolling,* is a term applied in mathematics to the process of finding the roots of numbers. A root of a number is one of its equal factors. Evolution is the reverse of *involution,* which is the process of raising a number to any required power (see INVOLUTION). To illustrate, by the process of involution 4 can be raised to the third power by using it three times as a factor; $(4)^3=4\times4\times4=64$. By the process of evolution the cube root of 64 is found to be 4. That is, 4 is one of three equal factors of 64. To indicate the extraction of a root the radical sign ($\surd$) is used. A small number, written in the angle of the radical sign, indicates what root of the number is required. This number is called the *index* of the root. When no index appears square root is understood. Thus, $\sqrt[3]{64}$ means the cube root of 64; $\sqrt[4]{64}$, the fourth root of 64; and so on. The processes of finding the square root and cube root of numbers are explained fully under the headings SQUARE ROOT and CUBE ROOT.

EXCAVATIONS IN ANCIENT LANDS. Throughout the ages, since the very beginning of time, the surface of the earth and the peoples thereon have been changing. Floods, earthquakes, volcanic eruptions and other natural agencies have destroyed and buried places which were once astir with as much life as is seen in villages, towns and cities to-day. Of some of these places we read in Biblical and ancient history, the stories having been written before they ceased to exist; yet the discoveries made through excavations round out those stories more fully. Scientific investigations have revealed, too, that there were prehistoric people also, and Mother Earth holds their story deep within her bosom. But chapter by chapter the interesting story of life is being read backward to the beginning, through excavations in ancient lands.

Little by little the habits, language, religion, culture and arts of ancient civilizations are being revealed. The pick and the shovel bring to light a tablet here, utensils there, in some places well-preserved entire homes, and even cities. Such fragments, pieced together, have brought to common knowledge something of the life of the early inhabitants of the United States—the Mound Builders. Excavations have brought to light the existence of prehistoric people in Mexico, Yucatan and Peru. They have told us the story of early Danes and Norsemen, and many others. The countries around the Mediterranean Sea, however, are now yielding and have, since the Middle Ages, yielded the greatest fund of knowledge and some of the most wonderful artistic treasures.

Greece. In the middle of the eighteenth century excavations in Greece disclosed the famous Venus de Milo, the Zeus temple at Olympia and the Athene temple at Aegina. Systematic diggings begun about a hundred years later, in 1869, brought to light the site of ancient Troy, built above the ruins of several other Troys. Work then conducted at Mycenae and Tiryns uncovered the old Greek civilization known as the Mycenaean. Excavations made since then at such historic places as Athens, Delphi, Sparta and Corinth have revealed further interesting facts about a people

who lived from about 1800 B.C. to about 1000 B.C.

Relics found in the island of Crete, however, tell of a civilization which existed before the Mycenaean. It is known as the Aegean and probably existed as early as 4000 B.C.; and relics found still deeper in the earth show that a race of people must have lived in that country about 10,000 years before the birth of Christ.

More recent discoveries in England, Germany, France and Spain have led scientists to believe that human beings lived throughout Europe as long as 100,000 years ago.

Italy. Originally, excavations in Italy were for the purpose of obtaining stone for building, but such diggings gave to the world those wonderful art treasures, the Apollo Belvedere and the Laocoön group, both of which are described in these volumes. In 1736 excavations were begun at Herculaneum and in 1748 at Pompeii, those two early victims of the fire-spitting Vesuvius. Although discoveries in Italy have been slow, excavations at Rome and in Southern Italy have revealed many new facts about the history and civilization of the Rome of long ago.

Biblical Countries. When Napoleon invaded Egypt at the end of the eighteenth century the book of the land of the Pyramids was opened to European scholars. Tablets inscribed in the Babylonian language were discovered, and when the key to the characters became known many interesting facts were brought before students of the Bible. Since the middle of the nineteenth century Assyria, Babylon and Palestine have been favorite fields of extensive excavation. Statues, monuments and tablets have been unearthed, some of which record the stories of Creation and the Flood; others tell about the reigns of ancient kings, such as Sennacherib and Nebuchadnezzar; others throw light on the life and customs of the ancient Canaanites and Israelites. Still others reveal bits of information about a people called the Hittites, and when more of the links in this story are found the history of an ancient and mighty people of Old Testament times will be more clearly revealed.

Recent Excavations. The work of piecing together the fragments of the great motion picture, so to speak, of the world and its peoples, has been going on for centuries. The discoveries of here an old coin, there a quaint piece of jewelry; at another place the wall of a city, or somewhere, perhaps, a burial place, have all added to the sum of human knowledge. The work of the Germans in the Mesopotamian valley, however, commenced in 1899, has perhaps yielded, up to 1914, the most important results. Among them the history of Nebuchadnezzar and his people has been revealed. Many objects of greatest historical value have been discovered, such as five tombs of other Assyrian kings and an old temple of Astarte.

In Egypt, in 1914, one of the oldest tombs of the land was discovered, the mystic tomb of Osiris. In that country valuable bits of manuscript were discovered by the English, among them about ten pages from the Idyls of Theocritus. Two rolls of manuscript by the poetess Sappho were also found. The discovery of a burial ground about two hours away from Cairo by rail revealed some 1,500 graves from which many interesting facts concerning the life of the Egyptians were gleaned. So, too, have many objects of value been discovered in Syria, Palestine, Asia Minor, Greece, Italy and Northern Europe. Systematic work in those lands will, no doubt, be continued in future years, and so new pages will be added in the stories of archaeology and anthropology (which see). M.S.

Related Subjects. While not all the references below to articles in these volumes relate to ancient lands, they are all of value to the student or reader:

Aztec	Osiris
Cave-Dwellers	Pompeii
Cliff-Dwellers	Pyramids
Herculaneum	Rosetta Stone
Mound Builders	Venus de Milo

EXCHANGE'. If you live in New York or Montreal and wish to pay a thousand dollars to a merchant in London or Paris you do not send him money. Instead, you buy at the bank a *bill of exchange,* a letter instructing a foreign banker to pay your creditor in English or in French money. According to the amount of gold in the national coins, £1 is worth $4.86\frac{2}{3}$; one franc, $19\frac{3}{5}$ cents. These amounts are known as the *par of exchange,* which means the normal rate; if you pay more, exchange is *at a premium;* if less, it is *at a discount.*

The rate of exchange between two countries is in general determined by the difference between the amounts which each is paying to the other. Thus, if on a certain day New York owes London £100,100, which at par is $487,152, and London owes New York only $486,665 (the equivalent of £100,000), the bank-

ers in the two cities can cancel each other's debts. New Yorkers will gladly pay $\frac{487,152}{486,665}$ of their obligations, or $4.87 for each pound bill of exchange, for it would cost them several cents to ship a pound of gold. On the other hand London bankers can sell bills at $\frac{486,665}{487,152}$ of the face value, accepting £1 for every $4.87. But if the difference between London's prospective payments and New York's is so great that $4.89½ is charged in New York for £1, some, as a rule, will find it cheaper to ship gold than to buy bills of exchange, while if the situation is reversed by London's debt becoming so much the greater that £1 will buy only $4.84, gold in normal times is shipped from England to America.

Exchange between two cities in one country is regulated by the same principles as foreign exchange. Thus, a check on New York will be accepted at par almost anywhere in the Eastern United States, but one drawn on a country bank will be discounted. The articles Banks and Banking; Check, and Bill of Exchange contain further information about exchange.

EXCHEQUER, *eks chek'er,* Chancellor of the, an officer who is in fact though not in name the treasurer of the British government. The law provides for a Lord High Treasurer and two junior lords of the treasury, but their positions are political rather than financial. It is the Chancellor who prepares the budget of expenses for the coming year and devises means of raising money for the government (see Budget). He must be a member of the House of Commons, and by virtue of his office holds a place in the Cabinet. His salary is £5,000 a year. The most famous of recent chancellors is David Lloyd George, who was succeeded by A. Bonar Law upon the elevation of the former to the post of Premier.

The word exchequer really means *chessboard,* and came to be applied to the Treasury Department because in earlier days accounts were figured and money counted on a checkered table, which was used like an abacus.

EXECUTIVE, *eg zek'u tiv,* or *ex sek'u tiv,* that governmental power of a country which is charged with the duty of enforcing the laws. The term includes the chief, or supreme, magistrate, to whom the sole governing power is confided, and is to be distinguished from the terms *legislative* and *judicial.* Under the United States government, the President is vested with this authority, and the governor of each state of the Union has in his hands the executive power of the state. The Governor-General is Canada's chief magistrate, while the emperor, king, queen or czar represents the executive authority, in theory, at least, in monarchies.

EXECUTOR, *eg zek'u ter,* or *ek sek'u ter,* in law, one appointed to carry out the provisions of a person's last will, and to act, after the testator's death, as his representative in all matters pertaining to his personal estate. Any person of twenty-one years, under no disability, such as unsound mind, may be an executor. One so named in a will may decline to serve, but once having undertaken the duty he cannot abandon it. An executor's duties are to probate the will, after qualifying for the position; to pay all bequests named in the will; to make an inventory of the personal estate and by sale to turn the surplus into money. He must keep separately all moneys of various funds, and where investments are made not directly specified in the will they are at the risk of the executor, and he must answer for any loss, unless he can show that he used due discretion. An executor must file an account with the probate court at the end of each year, should the administration be of long duration. His compensation is fixed by the court, and he is usually required by statute to give a bond for careful performance of duty; however, often by the terms of the will a bond is not required. Reasonable expenses are always allowed, and he is subject at all times to the direction of the court.

EXERCISE. See Athletics; Physical Culture.

EX'ETER, the oldest continuously inhabited city in England, the county town of Devon, 173 miles southwest of London. It is a city of considerable beauty and is full of historic interest, but like all English cathedral cities, is quiet and lacking in enterprise. In the heart of a rich agricultural district, it has an important market but has no manufactures of importance. A canal connects it with the River Exe at Topsham, once one of the most important ports in England. Vessels of 400 tons come to the Exeter docks, alongside of which are large storehouses and caves cut in the cliffs for the storage of oils. Iron founding, the making of agricultural implements and the manufacture of paper are the most important industries.

The cathedral is a magnificent building with a finely decorated west front. Remains of the

ancient Norman castle of Rougemont are still seen on the hill of Northernhay, which has been made into a public park. Parts of the ancient wall of Athelstan still stand, and the Guild Hall, in High Street, is a picturesque building erected in the days of Elizabeth. Long before the Roman invasion Exeter was an important town and it has had a part in all the internal struggles of England. Under the Romans it was known as Isca Damnoniorum. Population in 1911, 48,660.

EXILE, *ek'sile,* is banishment from one's native country by order of the state, for a number of years or for life; or voluntary residence of a person in some foreign country with a determination never to return to his native land. If a man is in exile for a crime committed at home, he may be forced to return for punishment; for the law governing his enforced return, see EXTRADITION. Banishment was a more common mode of punishment among the ancient than among modern nations. Great Britain formerly transported convicts to colonies in Australia and Tasmania, and Russia continues to send political exiles to Siberia, but this form of punishment is being gradually abandoned by civilized nations. Today the most enlightened nations do not exile for any offense, but punish offenders by imprisonment. The use of a part of French Guiana as a penal colony cannot be termed a species of exile, for those sent there are guarded as prisoners.

EX'ODUS, the second book of the Bible, in which the departure of the Israelites from Egypt in search of the Promised Land is fully described. Although the story of this period in Jewish history, in which Moses led his people away from the land of bondage, is very interesting, most of this portion of the Scripture is filled with laws, covenants of God, ordinances of rites and ceremonies and specifications for the Tabernacle. Thus the constitutional history of Israel was made during the discipline of the thirty-eight years' wandering in the wilderness. The life of the Israelites in Egypt takes up the first twelve chapters in the book; their journey from Egypt to Mount Sinai fills the next six chapters, while the last twenty-two describe the events at Mount Sinai. In the books of *Leviticus* and *Numbers* the same narrative is continued, so some modern scholars group these three books together as one, calling it the *Exodus,* which means "a going out," or exit. It was from Mount Sinai, the great center during the law-giving period of Israel's history, that the law of the Ten Commandments was received (*Exodus* XX).

EXOTIC, *ex ot'ik,* a word from the Greek, meaning *foreign,* or *from the outside.* It is especially applied to plants which belong to a soil and climate different from that of the country to which they have been brought, and which must receive special care to be kept alive. Many of the plants in the warmest rooms of park conservatories are exotics, having been brought from tropical lands. Trying to raise such plants under any conditions other than those to which they have been accustomed would mean their death. Therefore, the word also signifies something rare or delicate, and is used in that sense in literature, referring to things other than plants.

EXPAN'SION, in physics, is the increase in the volume of a body resulting from an increase of temperature. The addition of heat increases the motion of the molecules, which are driven farther apart and so cause the body to become larger (see MOLECULE). Nearly all solids expand when heated and contract when cooled, a notable exception being rubber, which contracts when heated. The amount of expansion varies with the nature of the substance. The expansion of aluminum is twice that of iron at the same temperature, and that of brass is one and one-half times that of iron. Gases expand when heated and contract when cooled, the rate of expansion being practically the same for all gases, and greater than it is for liquids and solids.

Liquids expand when heated and contract when cooled to a certain temperature, after which any further lowering of the temperature causes expansion. In general the denser fluids expand less than the lighter ones. Water ceases to contract in cooling when it reaches a temperature of about 39° F. On cooling further it expands until the freezing point, 32° F., is passed. Below the freezing point, its expansion is about one-eleventh of its volume; this accounts for the bursting of pipes and other containers when water freezes in them.

The action of the thermometer (which see) is based upon the principles of expansion, and many industrial applications are made of the expansion of solids and gases. For example, carriage-makers put iron tires on their wheels while hot; these contract on cooling and so clasp the wheels more firmly. Railway-builders leave small spaces between the ends of the rails to allow for their expansion in summer. See HEAT.

EXPECTATION, *ex pek ta'shun,* in the common sense of the word, is a state of anticipating, or looking forward to some event. The term is used by insurance companies to denote the number of years persons may expect to live under ordinary conditions. Tables of mortality, as they are called, have been carefully compiled from years of observation and experience, and are used as guides in fixing insurance risks and costs.

The following table of mortality takes as a basis for calculation 100,000 persons at the age of ten years. Of the 100,000 it is estimated that 749 will die before reaching the age of ten.

Table of Mortality

Age.	No. living.	No. dying.	Exp't'n of life.	Age.	No. living.	No. dying.	Exp't'n of life.	Age.	No. living.	No. dying.	Exp't'n of life.
10.....	100,000	749	48.72	39.....	78,862	756	28.90	68.....	43,133	2,243	9.47
11.....	99,251	746	48.08	40.....	78,106	765	28.18	69.....	40,890	2,321	8.91
12.....	98,505	743	47.45	41.....	77,341	774	27.45	70.....	38,569	2,391	8.48
13.....	97,762	740	46.80	42.....	76,567	785	26.72	71.....	36,178	2,448	8.00
14.....	97,022	737	46.16	43.....	75,782	797	26.00	72.....	33,730	2,487	7.55
15.....	96,285	735	45.50	44.....	74,985	812	25.27	73.....	31,243	2,505	7.11
16.....	95,550	732	44.85	45.....	74,173	828	24.54	74.....	28,738	2,501	6.68
17.....	94,818	729	44.19	46.....	73,345	848	23.81	75.....	26,237	2,476	6.27
18.....	94,089	727	43.53	47.....	72,497	870	23.08	76.....	23,761	2,431	5.88
19.....	93,362	725	42.87	48.....	71,627	896	22.36	77.....	21,330	2,369	5.49
20.....	92,637	723	42.20	49.....	70,731	927	21.63	78.....	18,961	2,291	5.11
21.....	91,914	722	41.53	50.....	69,804	962	20.91	79.....	16,670	2,196	4.74
22.....	91,192	721	40.85	51.....	68,842	1,001	20.20	80.....	14,474	2,091	4.39
23.....	90,471	720	40.17	52.....	67,841	1,044	19.49	81.....	12,383	1,964	4.05
24.....	89,751	719	39.49	53.....	66,797	1,091	18.79	82.....	10,419	1,816	3.71
25.....	89,032	718	38.81	54.....	65,706	1,143	18.09	83.....	8,603	1,648	3.39
26.....	88,314	718	38.12	55.....	64,563	1,199	17.40	84.....	6,955	1,470	3.08
27.....	87,596	718	37.43	56.....	63,364	1,200	16.72	85.....	5,485	1,292	2.77
28.....	86,878	718	36.73	57.....	62,104	1,325	16.05	86.....	4,193	1,114	2.47
29.....	86,160	719	36.03	58.....	60,779	1,394	15.39	87.....	3,079	933	2.18
30.....	85,441	720	35.33	59.....	59,385	1,468	14.74	88.....	2,146	744	1.91
31.....	84,721	721	34.63	60.....	57,917	1,546	14.10	89.....	1,402	555	1.66
32.....	84,000	723	33.92	61.....	56,371	1,628	13.47	90.....	847	385	1.42
33.....	83,277	726	33.21	62.....	54,743	1,713	12.86	91.....	462	246	1.19
34.....	82,551	729	32.50	63.....	53,030	1,800	12.26	92.....	216	137	.98
35.....	81,822	732	31.78	64.....	51,230	1,889	11.67	93.....	79	58	.80
36.....	81,090	737	31.07	65.....	49,341	1,980	11.10	94.....	21	18	.64
37.....	80,353	742	30.35	66.....	47,361	2,070	10.54	95.....	3	3	.50
38.....	79,611	749	29.62	67.....	45,291	2,158	10.00				

At the age of fifteen 96,285 are still alive, and their expectation of life, based on the experience of thousands of others, should be 45.50 years. Five years later 92,637 are living, with probably 42.20 more years of life. At the age of twenty-five the number alive would be 89,032, and their estimated allotment of life 38.81 years. At thirty, 85,441 of the original 100,000 are left alive. Carrying the calculations out to the age of ninety, only 847 would be alive, and the limit of their expectation would be 1.42 years. The full table will be a matter of interesting study to every member of a family. It appears above.

EXPLORATION, *ex plo ra'shun.* See POLAR EXPLORATION.

EXPLOSIVES, *eks plo'sivz,* a variety of substances which explode when ignited or when struck or otherwise subjected to a sudden high pressure. The essential constituents of an explosive mixture are a combustible substance which in combustion yields gaseous products, and an oxidizing agent. The force of the gases generated during the explosion is utilized for military and commercial purposes. The origin of the most familiar form of explosive, commonly called gunpowder, is not definitely known. Roger Bacon mentioned it about 1270, and Berthold Schwartz of Freiberg, Germany, described it about 1328. It was used by Edward I of England in his wars with Scotland. Some authorities claim that gunpowder was known to the Chinese centuries before it was discovered in Western countries, but of that there is no absolute proof.

Gunpowder. See the article GUNPOWDER.

More Modern Explosives. The increase of power in explosives effected by recent discoveries has necessitated improvements in guns and cannon, and for many years there has been a continuous race for effectiveness between explosives, guns and defense works. The discovery of guncotton by Schoenbein in 1845, and of nitroglycerine by Sobrero in 1847, put the science of explosives on an entirely new footing. In 1866 Nobel invented, or discovered, dynamite, which at once revolutionized all blasting operations. In 1886 Vieille produced the first really successful smokeless powder for military purposes. Nitroglycerine and guncotton still hold the field as the most effective for military purposes. All modern explosives

are directly or indirectly derived from nitric acid, one of the principal constituents of the saltpeter used in the original gunpowder. In general, the chemical compounds used as explosives are made by the action of a mixture of nitric and sulphuric acids upon non-explosive compounds, thus: picric acid is produced from carbolic acid; nitroglycerine from glycerine; guncotton from cellulose (cotton); trinitrotoluene from toluene.

Picric acid, also a product of nitric acid, is used as an explosive in the lyddite shells of the British army, and is deadly not only from the force of the explosion but on account of the fumes of the gases formed. Melinite, used by the French, is much the same in composition and effect. Trinitrotoluene is also much used as a high explosive for charging shells. Many experiments have been conducted in Germany with the object of producing explosives of greater power, but so far as is known nothing has been discovered to supersede guncotton and nitroglycerine. It is said that during the War of the Nations, before the end of 1915, the Germans were compelled by shortage of cotton to resort to wood pulp for the production of such explosives as had been previously dependent on guncotton. In that, however, they had been long anticipated, as Nobel in 1866 had used both wood pulp and fiber as a base for dynamite.

The manufacture of explosives is attended with considerable danger. In those consisting of chemical compounds the greatest care is necessary, especially in the preparation of the materials. For commercial purposes explosives are put up in various ways, the object being to render them as safe as possible to handle. Dynamite and blasting gelatin, with an average of more than thirteen times the power of gunpowder, are put up in "sticks" covered with paper. The sticks are usually about one inch in thickness and eight inches in length. The amount of dynamite used in blasts varies from half a stick to several thousands of pounds, according to the nature of the operations.

Related Subjects. The reader is referred to the following articles in these volumes, and to such other references as they suggest:

Ammunition	Guncotton
Artillery	Gunpowder
Carbolic Acid	Nitroglycerine
Dynamite	Picric Acid

EXPOSITION, *eks po zish'un,* INDUSTRIAL, an exhibition of large numbers of the products of industry and art. The great international expositions of the present decade, with thousands of exhibits from all parts of the world, are an outgrowth of the small local fairs which were common in Europe in the Middle Ages. These fairs were the earliest industrial exhibitions; the workers brought the products of their yearly or half-yearly labor to the markets for display and sale. Such gatherings seem originally to have had a religious character, but this was soon subordinated to the commercial. The fair at Saint Denis was held for the first time in A.D. 620, and that at Aix-la-Chapelle about 800. Such fairs are still common in various sections of Europe, but the most famous are those of Leipzig, especially for the trade in furs and books. The great fair at Nizhni Novgorod, held each year in July and August, is a notable event in the Russian Empire.

The modern industrial expositions have for their chief object the advertisement of products with a view to the ultimate increase in sales. Industrially, the modern exposition is a series of great sample-rooms, but along with the industrial features have developed other elements not of business character. Expositions now include displays of the fine arts, of educational material and of many things which are not intended to be sold. Above all, the visitors must be amused, and the so-called "concessions," or amusement stands, are now prominent features of all such enterprises. Most of the people who now visit expositions go not only as a matter of business, but they expect entertainment, as well.

Along with the attention to pleasure has come increasing regard for the architectural and landscape possibilities of a great exposition. The earliest buildings, like the Crystal Palace in London, were ugly structures of iron and glass. The buildings of the Centennial Exposition at Philadelphia were chiefly of iron, timber and glass. The first buildings of an entirely new kind were erected in Chicago for the World's Columbian Exposition in 1893. The framework was of timber and iron, but the exterior was a material called *staff,* a preparation composed largely of plaster of Paris. Being easily molded, this material permits artistic effects at small cost. The buildings are given a festive character, and the entire grounds have the appearance of a vast pleasure resort. Compared with wood or stone construction, staff is very cheap, but the material is perishable. In a few months, or at most a year, it cracks and begins to fall to pieces. Staff, however, serves all exhibition

purposes, for most buildings are torn down after the exposition closes. Nearly every exposition has left one permanent building or structure as a memorial. The Eiffel Tower and the magnificent Alexander III Bridge at Paris, the Memorial Art Gallery at Philadelphia, the German Building in Jackson Park, Chicago, and the Art Gallery at Saint Louis are monuments of past expositions. W.F.Z.

Related Subjects. The following expositions are given space in these volumes:

Alaska-Yukon-Pacific	Panama-Pacific
Centennial	International
Lewis and Clark	Pan-American
Louisiana Purchase	World's Columbian

EX POST FACTO. This phrase is Latin, and literally means *from something done afterward.* A law, for example, under which a man could be punished for a deed committed before the act was passed, is an *ex post facto* law. In its broadest sense the term applies to any law which changes the status of the past, that is, any law which is *retroactive,* making a deed a crime which was not a crime when committed. The Constitution of the United States expressly forbids the passage of *ex post facto* laws by the Congress.

EXPRESS COMPANY, an association or corporation which undertakes the transportation of small parcels and goods upon payment of fees. Such an enterprise is distinctly of American growth and has no counterpart in Europe, where the parcel post and railroads perform express services. In 1839 William F. Harnden advertised that he would undertake the transportation of small parcels and money between New York and Boston. His venture grew to large proportions and was copied by others, with the result that in a few years parcels and money could be sent to all parts of the United States, and eventually to many countries of the world, through express companies. Provisions for the issue and payment of money orders and the introduction of methods by which goods are paid for on delivery, still further increased the operations of express companies. Money orders and letters of credit issued by express companies are used by people abroad and prove of great convenience.

Express companies accept responsibility for loss or damage to articles they agree to carry, the amount of their liability being stated on the receipt handed to the shipper. In 1912 it was estimated that the four largest of the American express companies represented an investment of more than $40,000,000, with gross receipts amounting to nearly $132,000,000 yearly.

The introduction of the parcel post (which see) January 1, 1913, by the United States government as a branch of the Postoffice Department, seriously affected the business of the express companies.

EXTEN'SION, in physics, is that property of matter by virtue of which it occupies space. Every material object, even the most minute, occupies a certain amount of space and has dimensions of length, breadth and thickness. A line having no breadth is imaginary; the thinnest sheet of paper has a certain thickness or it could not materially exist. The two units used in the measurement of extension are the English yard and the international meter. See PHYSICS; MATTER.

EXTERRITORIALITY, *ex ter ri to ri al' i ti.* If the ambassador from Russia drives an automobile in the streets of Washington at a speed of sixty miles an hour the police will not arrest him. In theory he is not in the United States at all, and is subject only to the laws of his own nation. If he persists in disregarding American regulations, the American government may request that he be called back to Russia, but so long as he remains in the United States he and all his family and his retinue are free to act as they please. This is an extreme illustration, but states a legal condition; as a matter of fact, diplomats scrupulously observe the laws of the country to which they are accredited.

This doctrine that certain persons carry their country with them wherever they go is called *exterritoriality.* It applies first of all to sovereigns, for of course no ruler could ever subject himself to the orders of a foreign power. Secondly, it concerns ambassadors and other diplomats; they are the personal representatives of sovereigns and derive a certain sacredness of character from traditions of heralds, who from prehistoric to modern times were able to come and go in enemy camps without harm. Thirdly, exterritoriality applies, with limits, to ships and armies of foreign governments; in this case immunity is a matter of courtesy, not of right, and a visiting ship or army must do nothing to violate the neutrality of its host. Last of all, the rights of exterritoriality are granted by treaty to citizens of the great powers by some of the non-Christian countries. Thus, British or American citizens in China or Turkey are tried by courts of their own countrymen.

EXTRACTS, *eks'trakts,* the name of substances obtained in many different ways from plants, vegetables, meats, flowers, etc. The best method for extracting the delicate perfumes from flowers is that of cold *enfleurage,* by which the flowers are placed upon pure, cold lard held upon glass plates in wooden frames. Every day fresh flowers are placed upon the lard, until it becomes saturated with their perfume. Then the lard is dissolved with cold alcohol, which in turn is evaporated, leaving simply the extract from the flowers. The essence of violets thus extracted is worth over $1,350 a pound. Other less expensive methods of extraction by steam, through petroleum-ether or melted lard are used extensively. Lemon, vanilla, and almond extracts, which are juices reduced to a proper consistency by evaporation, are used a great deal in cooking. Beef tea is the juice extracted from beef, with much of the water evaporated. Many extracts, containing alcohol as a solvent, such as those from digitalis, aloes, chamomile and licorice, are used extensively in medicine. Each of these is described in these volumes.

EXTRADITION, *eks tra dish'un,* from the Latin *ex,* meaning *from,* and *traditio,* meaning *handing over,* is the delivery of an alleged criminal by one nation to another, wherein the crime was committed. The process by which a criminal or fugitive from justice is returned from one state or province to another, in the same country, is called *requisition.* Between nations the matter is one of international law, and is decided by treaties. Nations decline generally to extradite political offenders and refuse to surrender citizens of their own country for foreign countries to prosecute on such charges. A man may be extradited from the United States only for a crime which is a felony (which see).

American Requisitions. Criminals are extradited, or, more properly, *requisitioned,* from one state of the Union to another, by executive action. An affidavit is first made before a magistrate charging the person with the crime. The governor of the state is then petitioned to request the governor of the state to which the accused has fled to deliver the prisoner for return and trial. The person suspected is held until the arrival of the proper authority to take him back. The state making the demand for the return of the criminal pays all costs connected with the arrest and surrender. A governor may, in his discretion, refuse to honor a requisition from another governor.

EYCK, *ike,* VAN, a Flemish family which in the fourteenth and fifteenth centuries gave three great painters to the world. These were Hubert van Eyck (1366-1426), Jan van Eyck (1390-1441), and their sister Margaret (? - 1431). For transparent and brilliant coloring and minute finish, the works of the two brothers have never been surpassed. They were the first to perfect the mode of mixing colors with oil or some medium in which oil is the chief ingredient; and by their method of painting with wet upon wet color they changed the entire traditional habits of the earlier schools of painting. The varnish they used prevented the paint from cracking and enabled them to perfect the full rich color still to be found in their works.

They were probably born at Alden Eyck, or Maas Eyck, on the Maas (Meuse). They first lived at Bruges, and the younger brother is sometimes called JOHN OF BRUGES. Later they moved to Ghent. At the time of Hubert's death he was engaged upon their masterpiece, the gilded altar-piece, having as its subject *The Adoration of the Lamb,* part of which is now in the Church of Saint Bavon in Ghent. This is the only work which can with certainty be assigned to Hubert; it was not finished at his death, but was completed by his brother in 1432. The two central of the twenty-four divisions of this picture are all that now remain in the church at Ghent, the wings being in the galleries of Berlin and Brussels; in its entirety it represented one of the world's art treasures.

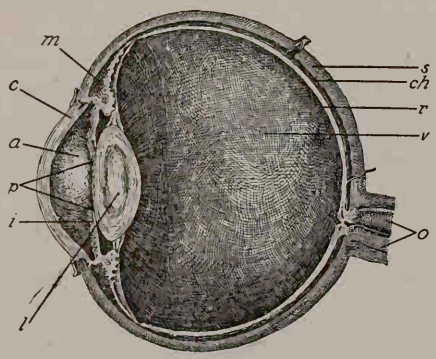
In the National Gallery, London, hang three portraits by Jan van Eyck; and in the Louvre, Paris, is his exquisitely finished picture of *Chancellor Rollin Kneeling before the Virgin.* Jan van Eyck also introduced improvements in linear and aërial perspective and in painting upon glass.

Margaret van Eyck is credited with some notable canvases, among which is a *Virgin and Child* in the National Gallery, London.

EYE, the organ of sight, is in many ways the most wonderful servant of the brain. One marvels at the great number of impressions the sense of sight alone may awaken. In reading a description of a battle, for example, one may *hear* the cannons roar, *feel* the pain of the wounded, and experience, to a certain degree, the thrills and emotions of the dreadful conflict. In the same sense the musician in scanning a sheet of music almost *hears* the written melody; while a person observing

another eating an orange or lemon feels that he actually *tastes* the fruit itself. Our first impressions of people are said to be, in great part, formed by what we see in their eyes.

Anatomy of the Eye. The eye is spoken of as a *ball,* or *globe;* accurately speaking, however, it is neither a globe nor a ball, since its vertical and transverse diameters measure slightly more than its anterior and posterior diameter, the former being approximately about one inch, the latter about nine-tenths of an inch. The eye is in reality a hollow ball filled with a *liquid,* a *solid,* and a *semi-solid*



CROSS SECTION OF THE EYE

(*a*) Aqueous humor
(*c*) Cornea
(*ch*) Choroid
(*i*) Iris
(*l*) Lens
(*m*) Ciliary muscle
(*o*) Optic nerve
(*p*) Pupil
(*r*) Retina
(*s*) Sclera
(*v*) Vitreous humor

body. The walls forming the ball are arranged in several layers, which are superimposed. The *outer* wall, or layer, is made up of two tissues which merge into one another. The posterior five-sixths of this wall is formed by a firm fibrous tissue called the *sclerotic,* which one sees as the *white* of the eye. It gives form and protection to the ball. Joining the sclerotic in front, and forming the remaining sixth, is a transparent portion, the *cornea,* which projects from the sclerotic as a watch crystal projects from a watch. The cornea is really the window of the eye. Within the sclerotic is another layer, the *choroid,* made up principally of blood vessels which are the chief source of nourishment for the tissues of the eyeball. This layer, as it runs forward, merges into another tissue, the *ciliary body,* and this in turn merges into the *iris.* The ciliary body contains the muscle used in focusing the eye, and to it also are attached the ligaments which hold the lens in position. The iris is perforated at about its center, forming the black spot, or *pupil.* By means of muscles in the iris substance, the pupil can be made to dilate or contract—grow smaller or larger—and in this way the amount of light permitted to enter the eye is regulated. The iris is variously colored in different individuals, forming the blue, brown or gray eyes, etc., the colors depending upon the amount and general distribution of pigment in the iris substance. A large number of infants at birth are blue-eyed. In many, however, after some weeks have passed the color of the iris changes, owing to the development of the iris pigment, and the eye becomes darker. In albinos the iris, in common with the hair and skin, has no pigment, which permits a reflection of the deeper blood vessels in the interior of the eye to be seen, causing such eyes to present a pink appearance.

Within the choroid lies the inner layer, the *retina.* This layer is formed by the special nerve of sight, the *optic nerve,* which, after leaving the brain, directs its course to the back of the eyeball, which it penetrates, and on reaching the level of the choroid spreads out on its surface as a nerve carpet or screen, forming the retina. The point at which the optic nerve enters the eyeball is known as the *blind spot* (Mariotte's), so that it is a curious fact that each eye contains a small area which is blind. Another small area in the retina of each eye, called the *macula* (*macula lutea*—yellow spot), is the area where vision is most distinct. On the interior of the eyeball, immediately behind the cornea and in front of the iris and pupil, is a space called the *anterior chamber,* which is filled with a liquid

DIAGRAM FOR EXPERIMENT

The above illustration can be used to prove the existence of a blind spot in the eye. Close the left eye; look squarely at the white cross. Move the page varying distances from the eye; at one point the right side of the drawing will become entirely black, the white spot disappearing. The explanation is that the white spot has come into a direct line with the blind spot.

called the *aqueous humor.* Just back of the iris is a double-convex, transparent, solid body, the *crystalline lens,* which is the essential structure in the function of accommodation, and is also the structure in which the disease known as *cataract* develops. Behind the lens is a large cavity, the *vitreous chamber,* filled

with the *vitreous humor,* a substance somewhat of the consistency of thin jelly. The eyeball itself is in great part enclosed in a membranous sac, the *capsule.* The anterior portion of the sclerotic is also covered by a delicate membrane, the *conjunctiva,* which is reflected from the sclerotic to the inner surface of the lids.

The eyeball rests in a bony cavity called the *socket,* or *orbit,* upon a cushion of fat which protects it from jars or shocks. It has attached to it at various points muscles which move it in the different directions. A gland, the *lachrymal,* is located under the upper lid at its outer portion, and this manufactures the tears. A number of pipe lines or ducts lead from this gland and open on the inner surface of the upper lid. During the act of winking these ducts are squeezed, and in this way the delicate cornea of the eye is sprayed with the tears, and its surface kept moist and brilliant. The tears are carried away partly by evaporation and partly by drainage canals located at the inner corner of the eye, one on the margin of each lid, which lead by a duct or channel into the lower portion of the interior of the nose.

The lids are formed of loose tissue, embedded in which are plates of stiff material called *tarsal cartilages,* which give them form and firmness. The upper lid is very movable; the lower lid moves but little. The eyelashes are inserted in the margin of each lid, those of the upper curving upward, those of the lower downward, in order that they may not interlace when the eye is closed. The opening between the lids is called the *commissure.* A large or small eye depends not upon the size of the eyeball itself, but upon the width and breadth of this *commissure* which permits a greater or less amount of the eyeball to be seen. The eyelids and eyelashes are a great protection to the eye; they safeguard it from flying bodies, dust and wind, shade it from the light, and by the act of winking sweep it of dust and distribute the tears and keep its surface moist. The *eyebrows* shade the eyes and prevent dust and perspiration from entering them.

How We See. Light is a form of energy caused by vibration of the ether. It eminates from a luminous body as waves, called *rays.* When an object is seen, the rays of light from this object strike first the cornea of the eye, then pass through it and through the anterior chamber, pupil, lens and vitreous humor. These media, as they are called, refract, or bend, the rays to such a degree that they are all collected into a small point, and come finally to a focus or meeting place on the retina, which is the receiving nerve screen of the eye. The different rays from the object really form upon the retina a miniature picture of the object looked at, and this picture is relayed to the optic nerve, which in turn carries it to the center of sight in the brain, where it is finally interpreted as the picture of the object itself. Each eye conveys a separate picture of the object looked at to the sight centers in the brain, and these pictures are inverted, or upside down. In the sight centers, however, by a process little understood, the two pictures are fused or merged into *one single, distinct image of the object looked at,* and the inverted position is corrected; so through these agencies the final result of the visual act is that in normal eyes only one object is seen, and this in its correct, upright position.

Accommodation. If you look at something very near to your eye, objects at a distance then become indistinct; if, on the other hand, you gaze at something far away, objects close at hand become hazy. This is so because no lens can focus on the same screen at the same instant rays of light coming from a near object and rays of light coming from a distant one. In order that a clear, well-defined, distinct picture of an object be seen it is necessary that the rays of light coming from this object be brought to a definite, precise focus on the retina and that all other objects not within this particular distance be more or less excluded from consideration.

In a camera the adaptation, or focusing, for near and distant objects is brought about by moving the lens of the camera forward and backward the appropriate distance. In the human eye, however, it is not possible to alter in this way the distance by moving the lens of the eye backward and forward, but the adjustment is brought about by the human lens changing its shape or curvature to suit the varying distances. This function of the lens is designated as that of *accommodation,* and is brought about by a highly-complex nerve-muscle impulse-adjustment.

We Cannot Always Believe What We See. In spite of the wonderful structure of our eyes they would be untrustworthy if *intelligence* were not applied to correct their mistakes. Are the things we see outside of our eyes or

inside of them? We are so used to thinking that they are outside that it is hard to realize that what we see is not the world outside of us, but the pictures of it on our retina formed by the vibrations of light. A person who has been blind all his life and suddenly is given sight is conscious that the picture he sees is inside his head, and thinks all the objects in it are close to him. He has to learn from experience, as we did when we were small children, to judge of such matters as distance and motion.

Why do the earth and sky seem to meet, and the rails of a car track to come together in the distance? If you hold this book about five inches from your eye, the rays from the top and the bottom of it will meet at right angles on the cornea, and the image of the book will occupy nearly the whole of the retina. If you hold it farther away, as in the

Explanation of illustration will be found in the accompanying text.

illustration, the rays from the top and bottom will be closer to the rays from the center, and if you had neither intelligence or experience you would say the book is smaller. Thus as you look at a railroad track the rays from rails near you enter the eye at an angle and are *refracted* to the edges of the retina. But the farther away a rail is, the closer are the rays from it to those from the center of the track. The rays from the very distant rails occupy the same spot on the retina as the rays from the center, and our eyes tell us that the rails have met.

Why the Wheel of a Moving Automobile Appears Solid. The impression made on the retina by each light wave lasts from one-fiftieth to one-thirtieth of a second. If a wheel is revolving rapidly, we get a new picture of each spoke before the old one has disappeared; thus the image of the spoke is in several places on our retina at the same time. This is the principle upon which moving pictures depend, but in order to prevent their being an indistinct blur, like the automobile spokes, each picture rests an instant as it comes before the eye.

Defects of the Human Eye. Sight is made up of a combination of three sub-senses, namely, sense of *light*, sense of *form* and sense of *color*. The *light sense* enables us to appreciate the varying intensities of light; the *form sense* conveys information as to the shape of an object; the *color sense* distinguishes the color. All eyes are not normal—from an optical or other standpoint. The great majority present some defects, varying in degree and character, which are commonly spoken of as long- or short-sightedness, old sight, astigmatism, color blindness and cross-eyes.

Care of the Eyes. We learn from a paragraph above that the lens of the eye accommodates itself to our varying needs by changing its shape when we wish to look at an object near at hand or one at a distance. Now the nerves and muscles that cause the lens so to adjust itself become very tired if overworked, and when badly abused we suffer from what is called *eye strain*. The habit of reading in a poor or fading light is a very common cause of eye strain. Reading while traveling on a jolting train is very injurious, because the distance of the book from the eyes is constantly changing, and the muscles must work overtime to keep the lens in adjustment. A pernicious practice also is that of reading while lying in bed or while ill. Reading in these positions imposes great strain upon the eyes, and if one be ill, in addition, the general lowered muscle and nerve tone associated with the illness is shared by the eyes, and abuse of them at such times is distinctly injurious. Many serious diseases of the eye result from the practice of permitting untrained persons to attempt the removal of dust, cinders, etc., from the eyes. This practice should be condemned vigorously.

It would prove a profitable and wise custom if individuals contemplating entering a profession or occupation requiring great demands upon the eyes would in advance determine if their eyes are suited to the work about to be assumed. Such forethought would often spare the sad disappointments and hardships which a later development of inadequate or troublesome vision inflicts.

The majority of eye diseases are caused by germs which are communicated to the eye through the medium of unclean hands, soiled linens or other media. One cannot be too careful about what touches this delicate and priceless organ. Never dry the face with a towel that is hung in a public wash room—the uncivilized "roller towel," for example—for it may harbor in its meshes countless germs of diseases which may be communicated to the

eyes during the act of drying the hands or face. It should be remembered that many diseases, like measles, grip and diphtheria, frequently involve the eyes during their course, and on the first evidence of eye symptoms the physician or oculist should be consulted. An uncompromising rule should be that an eye discharging pus or matter is a dangerous eye, dangerous to its owner and to everyone with whom he comes in contact, and therefore should not be neglected but should receive immediate attention.

Another rule of equal importance is that one should never neglect even trivial conditions of the eyes. They are exceedingly delicate organs, and their value to the individual for his happiness and comfort is probably unequalled by any other organ of the body. Early attention to all defects by a competent oculist should be the watchword. Suitable glasses should be worn, if required, and the proper glass should always be worn when automobiling or when the eyes are exposed to intense light. Dentists and workmen engaged in occupations where flying particles are common should wear protective spectacles. Wearing of veils with thick-figured meshes should not be practiced, as such a custom tends to develop eye strain.

The eyes of infants require special care and safeguarding. They should not be exposed to bright light, and the shades of their little carriages should be of dark-colored material, which effectually shades them from the light. In its early years the child should not be permitted to use the eyes for prolonged periods, looking at picture books, printed matter, etc., or engage in close or near eye work for any considerable length of time, for during their formative periods children are very likely to develop eye strain or other serious eye defects. Outdoor enjoyments for growing children are as desirable from an eye standpoint as from that of general health. R.J.T.

Related Subjects. The reader is referred to the following articles in these volumes:

Astignatism	Cataract
Blindness, with subheads on *Diseases*	Color Blindness
	Senses, Special

EZEKIEL, *e ze′ki el,* a Jewish prophet who was carried away with his people as a captive by Nebuchadnezzar, when the latter took Jerusalem in 597 B. C. He lived near the river Chebar in Babylonia, was brought up under the ministry of Jeremiah, the prophet, and began his work when he was thirty years old, continuing it for twenty-two years. The time and manner of his death are unknown. The book in the Old Testament known by his name is filled with his prophecies, arranged nearly in the order in which he delivered them. They abound in figures of speech and symbols referring to customs of his time, which are unknown to-day. He is known as one of the four great prophets, the others being Jeremiah, Isaiah and Daniel, and is known especially as the prophet of the Captivity.

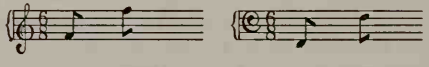
EZ′RA, a Jewish scribe and high priest whom Artaxerxes, the king of Persia, sent to Jerusalem to investigate the civil and religious condition of the Jewish community in 458 B. C. Accompanied by 1,500 other Jewish exiles, whom he was permitted to lead back to Palestine, he arrived at his destination four months after he left Babylon. He was much amazed to find that many Jews had married heathen wives, but he soon brought them back to the observance of the Mosaic law. Thirteen years later, when Nehemiah came to Jerusalem, Ezra took a leading part in reading the law of Moses to the colony and did much important work in preserving and circulating the sacred books. He marks a transition from the prophets to the scribes, and was, in a sense, the forerunner of the rabbis who played so important a part in the later Jewish life and religion. Some Bible students believe that Ezra was the author of the Pentateuch, but the evidence is inconclusive.

The Book of Ezra once included the book of Nehemiah, but it is now a separate book of the Old Testament. It is filled with public records and documents which were copies of letters sent to Persian kings by officials of his provinces. There are two parts to the book; the first deals with the return of the Jews to Babylon in 538 B. C.; the second tells how Ezra led the exiles home eighty years later.

Ff

F. Exactly how the sixth letter of our alphabet developed from the bent nail *vau,* which held the same place in the Phoenician alphabet, no one knows. The Greek *gamma* (Γ, γ) was doubtless the same character, though pronounced differently, and the ancient Greek *digamma,* or *double gamma,* was written **F**, but was probably sounded like our *w*. Strangely enough, our numeral *6* is a survival of *digamma.*

In music *F* is the fourth note in the natural scale of C.



FABIUS, *fa'bi us,* the family name of several of ancient Rome's most famous men.

Quintus Fabius Maximus Rullianus, a successful general, was probably the first of the line to be called Maximus, or *The Very Great.* This honor he earned in 304 B.C. by excluding freedmen from all but the four city tribes, thus giving the aristocracy control of the *comitia* (which see).

Quintus Fabius Maximus Cunctator was the true Maximus of the Fabian gens. His name, *Cunctator,* or *Delayer,* he gained by his tactics when, as dictator, he opposed the hordes of Hannibal in 217 B.C., constantly harassing the Carthaginian's provision trains and advance and rear guards, but always refusing to give battle. George Washington has been called *The American Fabius,* because he, too, won battles by not fighting them.

Caius Fabius Pictor, as his last name shows, was a painter, and in 302 B.C. made the first Roman paintings of which we know.

Quintus Fabius Pictor, grandson of the painter, wrote the first prose history of Rome.

FABLE, *fa'b'l.* This word, from the Latin *fabula,* means literally any *story,* but is commonly used to describe a very special kind of narrative—a short story which is told not just for its own sake, but to point a moral. Usually the characters are animals or inanimate objects, but these are gifted with all the traits of character and the powers of human beings, and by their wisdom or folly teach useful lessons. The point of the lesson is not left to chance, but it is clearly stated at the end in a single outstanding sentence, labeled *Moral.* Here, for instance, is a typical fable by Aesop, in true fable form:

The Fox and the Grapes

A hungry fox once saw some fine, luscious grapes hanging temptingly from a vine a few feet above his head. He leaped and snapped and leaped again, but never could he quite reach the grapes. So many times did he try that he tired himself out completely, and it was some time before he could drag himself limping away. As he went along he grumbled savagely to himself, "What nasty things those grapes are! No gentleman would eat a thing so sour."

Moral: Every man tries to convince himself that the thing he cannot have is no good.

This fable, written centuries ago, is to-day a part of the life and thought of civilized people everywhere. If a man sees another man pretending to scorn a certain really desirable thing he might say, "He's trying to make himself and us believe he doesn't want it, just because he can't have it"; but that would be a cumbersome, heavy way of expressing his meaning. What he does say, with a sly smile, is, "Sour grapes!" and everyone knows what he means.

What, then, is the difference between a *fable* and a *parable,* which may also be described as a short story told not for its own sake but to illustrate a truth? It lies in one very definite point: a parable never bestows on animals or things powers and characteristics which they

do not really possess. For instance, in one of the best known of all, the Biblical parable of the lost sheep, it is not the sheep which speaks. If this were a fable the sheep would have the power of speech, and would tell how it had suffered for wandering from the fold, and how the shepherd, leaving the ninety and nine in safety, followed it through all its dangers until he bore it back to safety.

The earliest fables were written in India, for the Oriental mind appears to have a peculiar faculty for expressing itself by such indirect means, and it seems certain that the best-known fables in all the world, those famous ones called *Aesop's Fables* (which see), were founded on these early Hindu tales. Later writers have tried to imitate these simple, perfect stories, but few have succeeded. Horace produced one, the *Town Mouse and Country Mouse,* which is fit to rank with Aesop's *Hare and Tortoise, Fox and Grapes, Lion and Mouse, Fox and Crow* and other classics; and Lafontaine, a French writer of the seventeenth century, published a series of *Fables* in verse which are by far the most famous of all modern writings of this sort, and are learned by every French school child. He gave in four short lines the reason for the popularity and effectiveness of fables:

> Fables in sooth are not what they appear;
> Our moralists are mice, and such small deer.
> We yawn at sermons, but we gladly turn
> To moral tales, and so, amused, we learn.

Many of Andersen's best-loved tales, as *The Ugly Duckling, The Hardy Tin Soldier, The Darning Needle, The Snow Queen,* are fables of a sort, in that they teach lessons through stories, but they have far more complicated happenings and a much greater wealth of detail than has the typical fable. The same may be said of Harris's *Uncle Remus* stories and of Kipling's *Jungle Books,* which possess many of the characteristics of fables. A.MC C.

FAÇADE, *fa sahd',* the front of a building, but particularly the principal front, or the *face.* Unlike a person, a building may have a number of faces. As a rule, though, there is one *façade* more important than the others. In cross-shaped churches, for instance, there are usually north, south and west façades, of which the last is the largest and most prominent. A *screen* façade is one which is broader and higher than the building behind it.

FACE, THE. No other portion of the human body is in itself quite so intimate a part of the personality as the part we call the *face.* Every normal person comes into the world with a forehead, two eyes, a nose, a mouth, a pair of cheeks and a chin, which together comprise the face, but there is a different combination for each individual, and because of this variety in the human countenance we learn to recognize our fellow beings and to tell them apart. While the term *beauty,* in connection with the body, includes many other factors, it refers primarily to the face; we consider our friends beautiful when they have a pleasing combination of features, eyes and complexion. Through the face, too, is expressed much of what goes on in the mind. There is a circular muscle surrounding the mouth, and one around each eye, while other muscles radiate from the edges of these. By means of the face muscles we express all our varied emotions—joy, grief, despair, contempt and a host of other feelings. An American poet of the nineteenth century, Abraham Coles, has expressed this thought in these words:

> Unmatched by Art, upon this wondrous scroll
> Portrayed are all the secrets of the soul.

The skeleton of the face, exclusive of the thirty-two teeth, consists of fourteen bones. All but two of these, the lower jawbone (*mandible*) and the *vomer,* which separates the nostrils, occur in pairs. The two bones of the upper jaw form most of the hard palate in the roof of the mouth. The two *palate* bones, which complete the hard palate, lie in front of the opening through which air passes into the throat cavity from the nasal chambers. The cheek bones are the two *malars.* Forming the bridge of the nose are the two *nasal* bones, while the *lachrymal,* or *tear* bones, lie between the eye sockets and the nose. Finally, there are two *turbinate,* or spongy, bones, which form the outer wall of the nostrils. Of all these bones only the lower jaw is movable. See SKELETON; also HEAD, for illustration of the bones named above.

FAC'TORING, the process of separating a number into the quantities which, when multiplied together, will produce it. The integral numbers which, multiplied together, produce that number, are called its *factors.* Every number is the product of itself and 1, and so has itself and 1 as factors; for example, $6\times1=6$; $19\times1=19$.

$$6\times7=42$$
$$3\times6=18$$
$$4\times9\times2=72$$

6 and 7 are factors of 42; 3 and 6 are factors of 18; 4, 9 and 2 are factors of 72. Each of

these three numbers has other factors; for example, 2 and 21 are factors of 42; 2 and 9 are factors of 18; 3, 8 and 3 are factors of 72.

A number that has no factors except itself and 1 is a *prime number,* as 19, 3, 37, 2, 101.

A prime number used as a factor is a *prime factor;* for example, in $3\times7=21$, 3 and 7 are prime factors of 21; in $5\times7\times23=805$, 5, 7 and 23 are prime factors of 805.

A number that has factors besides itself and 1 is a *composite number;* for example, 4, 9, 25, 150.

A composite number used as a factor is a *composite factor;* as, $4\times9=36$. 4 and 9 are composite factors of 36. $4\times25=100$. 4 and 25 are composite factors of 100.

A factor of a number will divide the number exactly (without a remainder) and so is called a *divisor* of the number. $3\times7=21$. 3 and 7 are factors of 21. $21\div3=7$; $21\div7=3$. They are also divisors of it.

Exercises. (1) Name all the prime numbers from 1 to 100. How can you tell which of these numbers are prime? (See DIVISIBILITY OF NUMBERS, and study it in connection with factoring.)

(2) Using the "tests for divisibility," tell by what numbers from 2 to 11, inclusive, each of the following is divisible:

84	384	402
81	561	1168
27	9729	7986
75	37800	105

(3) Tell which of the following numbers are prime and which composite:

26	441	88	3069
18	79	41	671
59	111	171	407
38	119	67	729
66	167	57	1023

Separation of a Number into Prime Factors. (1) Let us separate 72 into its prime factors.

(a) $72=8\times9$
(b) $72=(2\times2\times2)\times(3\times3)$
(c) $72=2\times2\times2\times3\times3$

In (a) 72 is separated into two composite factors, 8 and 9. In (b) these factors are separated into their prime factors, and we have the prime factors of 72. In (c) the parentheses are dropped; (c) may be written in another form, which is very convenient, by using the exponent, thus: $72=2^3\times3^2$. The exponent *3* tells how many times 2 is used as a factor in 72, and the exponent *2* tells how many times 3 is used as a factor in 72.

(2) We shall factor 81, showing the steps as above.

$81=9^2$
$81=9\times9$
$81=(3\times3)\times(3\times3)$
$81=3\times3\times3\times3$
$81=3^4$

The exponent *4* shows that 3 is used as a factor 4 times in 81.

(3) Factor 144.

$144=12^2$
$144=2\times6\times2\times6$
$144=2\times3\times2\times2\times3\times2$
$144=2^4\times3^2$

Another method of finding the prime factors of a number follows:

(4) Find the prime factors of 1365. 1365 is divisible by 5, since it ends in 5. Divide, and we see that $1365=5\times273$. 273 is divisible by 3, since the sum of its digits is divisible by 3. Divide, and we find that $1365=5\times3\times91$. Dividing 91 by 7, we find $1365=5\times3\times7\times13$. A more concise form is this:

$5\overline{)1365}$
$3\overline{)273}$
$7\overline{)91}$
13

These steps may be summarized as follows:

(1) Separate the number into any of its composite factors and then separate these factors into their prime factors, as in (1), (2) and (3) above.

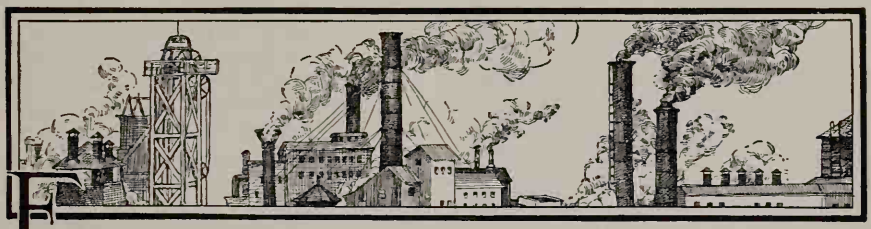
(2) Divide the number by one of its prime factors; then divide the quotient obtained by one of its prime factors; continue this process until the quotient is a prime number. The divisors and the last quotient are the prime factors of the number, as in (4) above.

Common Factor. A factor that occurs in each of two or more numbers is called a *common factor* of the several numbers; for example, 8 is a factor common to 16, 24, 48, 72; 7 is common to 28, 56, 105. A common factor is called also a *common divisor* and a *common measure,* because it divides each number exactly, and with it as a measure we may evaluate and compare the several numbers; for example, 7 is a common measure of 35, 42, 84 and 21. 35 is 5 sevens, 42 is 6 sevens, 84 is 12 sevens and 21 is 3 sevens.

Greatest Common Factor. The largest factor or divisor which is found in each of two or more numbers is called the *greatest common factor,* the *greatest common divisor,* and the *greatest common measure* of the several numbers. For example, 24 is the largest factor found in 48, 72 and 96. Therefore 24 is the greatest common factor, the greatest common divisor and the greatest common measure of 48, 72 and 96.

Numbers Prime to Each Other. 16 and 45 have no common factor other than 1; 25 and

36 have no common factor except 1. When numbers have no common factors other than 1, they are said to be *prime to each other.* For full discussion of greatest common divisor see the article of that name. For full discussion of multiples, see LEAST COMMON MULTIPLE. See, also, for closely-related subjects, FRACTIONS; SQUARE ROOT; CUBE ROOT. A.H.



FACTORY AND FACTORY SYSTEM. The word *factory* suggests great buildings in which hundreds of men, women and perhaps children are engaged in making thousands of articles. The factory is typical of modern industry; it is the application of economic law to the process of production. By division of labor a large number of workmen coöperate to make at a lower cost many times more articles than the same number of workmen could make if each worked separately. Strictly considered, a dozen men, working in the same building and each making a complete pair of shoes a day, would not be workmen in a factory. But their shop would be a factory if these twelve men worked in coöperation, and if each man performed only a few of the processes, with the result that not one dozen pairs but many dozen pairs were finished each day. The essential feature of the factory system is not the number of workmen, or the use of machinery, or the increased output, but it is the division of labor. Any establishment in which a number of persons *coöperate by consecutive processes* in the production of an article may be called a factory.

Development of the Factory System. The factory system did not suddenly spring up, fully developed, but it grew by degrees. It arose about the middle of the eighteenth century, when new inventions were beginning to take the place of hand labor—about the time that Arkwright's and Hargreaves' spinning jennies, Cartwright's power loom and other inventions revolutionized the manufacture of cotton goods. The introduction of automatic machinery was accompanied by the persecution which all pioneers must face; many inventors, a few now famous and many lost in obscurity, spent years in perfecting machines only to have them destroyed by mobs. Some people thought that machinery was the work of Satan, and others thought that it would throw all workmen out of employment.

These two types of opponents could not stop the growth of the factory system, and during the nineteenth century its development, not only in Great Britain and America, but throughout the civilized world, made it possible for the inventor to protect his own interests as well as benefit his fellows. The patent system stimulated invention, for the man of ideas could then be sure that his neighbor could not steal his plans without punishment. Inventions were soon recorded in all branches of industry.

Besides the introduction of automatic machinery and the development of the patent laws, the factory system owes its growth to two factors—the use of steam as motive power and the development of transportation facilities. At first all machinery was driven by water power. This meant that a factory had to be placed at some spot where there was sufficient water power, regardless of location with reference to the markets or labor supply. When, however, steam power became available, the factory owner could locate his plant wherever the supply of workmen and the demand for his products seemed to make a factory most desirable.

Even with this restriction on location removed, the factory system could not have reached its greatest development with the slow and costly methods of transportation used in the eighteenth century. The use of steam power in manufacturing freed the manufacturer from the restriction of location, but the application of steam to railroads and ships did more, for wherever he might be, it opened to him the markets of the world. To be sure, nations sometimes restrict markets by impos-

ing tariffs, or even by going to war, but under normal conditions the manufacturer in any country may compete wherever it pleases him to do so.

Benefits and Evils of the Factory System. The benefits of the factory system have been enormous. The old argument that the introduction of machinery would be followed by lack of work and poverty has long since been disproved. It is now admitted that the factory system merely diverts labor to the most profitable channels. A factory-made shoe, finished in twenty minutes, will wear as well as a hand-made shoe which the individual shoemaker makes in one day. A factory-made watch, finished in a few hours, keeps as good time as a Swiss hand-made watch finished in nearly as many weeks. The Swiss watchmaker, moreover, gave the best years of his life to an apprenticeship which is no longer necessary. As a general rule the division of labor has resulted in a vast improvement in the quality of the article, in a great saving of time, and consequently, in a reduction in the cost of manufacture. Lower cost means lower prices, which in turn have increased the demand for labor, and the increased demand for labor has been followed by higher wages and a higher standard of living. While there are sections or industries in which these facts may not always be apparent, they cannot be questioned if the effect upon the civilized world is considered as a whole.

That the factory system has its evils is also true, but their importance is easily exaggerated. Women and children have doubtless been employed in greater numbers under the factory system than ever before; but their employment did not begin with the factory, and in many respects the conditions of work are better in the factory than outside of it. Unsanitary conditions do exist in some factories, but they are not to be compared with the wretchedness of sweat-shops or tenement homes. It is true that by regulating the speed of machinery the work-pace may be forced so that the factory wears out the workman at a comparatively early age—perhaps forty-five or fifty years is the average in most trades —but on the other hand the factory provides better pay and shorter hours of work. It has made possible a higher standard of living, under which the laborer has more time for recreation and self-improvement. In some respects the minute division of labor permits the use of a lower order of intelligence, since the workman need understand only one step in a complicated process; but, on the other hand, by associating with other workmen the individual acquires new ideas and a broader outlook on life.

No further evidence of these facts is needed than the success of labor organizations in securing better working conditions for their members and their constant struggles for still higher standards. Perhaps the most conspicuous result of the factory system has been the widening gulf between labor and capital; at one extreme are the powerful labor organizations, at the other extreme are the great combinations of capital in production.

Related Subjects. The reader is referred to the following articles in these volumes:

Invention	Labor Organizations
Labor, Division of	Patent
Labor Legislation	Trusts

FAHRENHEIT, *fah'ren hite,* GABRIEL DANIEL (1686-1736), a German scientist, ranking high in the realm of physics and famous as the inventor of the thermometer scale that bears his name. He was born in Danzig, Germany, but lived for some years in Holland and England, making his living by the manufacture of meteorological instruments. He was the first to employ mercury instead of alcohol in thermometer tubes, thus greatly adding to the accuracy of the instrument. He was elected a member of the Royal Society of London in 1724. See THERMOMETER.

FAÏENCE, *fa yahNs',* a soft-bodied, glazed pottery first made by the Italians at Faenza, from which it received its name. The French learned the method and improved upon it, until a very beautiful ware was produced in the sixteenth, seventeenth and eighteenth centuries. It became very popular, and during the wars of the reign of Louis XIV, when all silverware was being sent to the mint, faïence sets were made for the royal palace and the nobles at court. Josiah Wedgwood, whose wares are now so famous, started a faïence factory in England in 1763. The Rookwood pottery, made in Cincinnati, O., is faïence of a high order; its decoration is unusually beautiful. See WEDGWOOD WARE; ROOKWOOD POTTERY.

FAINT'ING, or SYNCOPE, *syng'ko pe,* is loss of consciousness and of power to move and to feel. The face of a fainting person becomes pale, the breathing process is for the time being suspended, and the pulse at the wrist ceases to beat. There is such complete loss of muscular power that a person who

faints while standing always falls to the ground. Fainting is caused by the temporary checking of the action of the heart, as a result of which too little blood is sent to the brain. This failure of the heart to act may be due to a variety of causes—exhaustion, loss of blood, pain, fright, excessive grief, shock, etc. It is sometimes a result of organic heart trouble, and it may occur with other diseases.

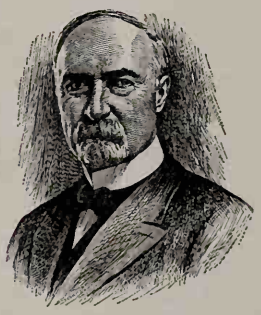
In all cases of fainting the patient should be placed on his back, with the head and chest lower than the rest of the body, so the blood may flow more easily to the brain. The clothing should be loosened to permit freedom of breathing and of circulation. Cold water may be thrown on the face to stimulate the nerves which hasten the action of the heart, but in case of a protracted faint it is often necessary to administer stimulants hypodermically. Such cases require a physician. W.A.E.

FAIR, *fare.* It is so easy nowadays to visit the grocery store or telephone to the grocer, that we forget that our ancestors—perhaps our very fathers and grandfathers—had to purchase months' or even a year's supply of provisions at one time. Until the railroad and the steamboat began to serve the world it was impossible to distribute the products of all the industries as they are distributed to-day, in a continuous flow from producer to consumer. Thus it was that back in the days of the Roman Empire men began to hold fairs, periodical gatherings of merchants to which the people could come to collect supplies. As time went on the importance of fairs increased and during the Middle Ages thousands of them were chartered. Often such charters were granted to churches or to monasteries, and the fairs were held on religious festivals.

Fairs to-day are of many sorts. In America the most common is the agricultural fair, discussed in the article EXPOSITIONS, INDUSTRIAL. Church fairs, or bazaars, are obviously survivals of the medieval fair, and so, too, is the *kermis* (the word means *church mass*) of Holland and Brittany. In Europe there are a number of great fairs which still maintain their medieval character. The annual gathering at Nizhni Novgorod in Russia draws merchants and purchasers from all Europe and Western Asia.

FAIR'BANKS, the largest city of Alaska. It is the seat of the Fourth Judicial District, which comprises all the interior of the territory, and is situated just half way between the north and south coasts. It is on the Tanana River, a branch of the Yukon, and during the five open months of summer has steamboat connection with Saint Michaels, near the mouth of the Yukon, and with Dawson and other points on the Upper Yukon. In the past the approach by land has been by stage from Valdez, on the south coast, but Fairbanks, as shown by the special map in the article ALASKA, is now on the route of the new government railroad, 471 miles north of Seward. An older railroad runs from Fairbanks forty-five miles into the gold fields, and it is probable that the government will some day extend its system to the Yukon. In spite of its isolation and its small population (3,541 in 1916), Fairbanks has electric lights, telephones and the telegraph, a central steam-heating plant and other modern conveniences.

FAIRBANKS, CHARLES WARREN (1852-), an American lawyer, former Senator, and for one four-year term Vice-President of the United States. He was born near Unionville Center, Ohio, of which state his father was one of the pioneers. The son received his early education in the common schools, and was graduated from Ohio Wesleyan University in 1872. He was admitted to the bar in 1874 and removed to Indianapolis the same year. In 1896 he was delegate-at-large to the Republican national convention in Saint Louis, and was appointed a member of the United States and British Joint High Commission which met in 1898 in Quebec to adjust the Canadian questions relating to the Alaska seal fisheries.



CHARLES W. FAIRBANKS

Fairbanks was elected to the United States Senate in 1897 and was reëlected at the expiration of his term. In 1904 he was elected Vice-President of the United States on the ticket with Theodore Roosevelt; at the close of his official term of office he made a tour of the world. In 1916 he received the complimentary vote of his state in the Republican national convention for the office of President of the United States, and was nominated for the Vice-Presidency on the ticket which was headed by Charles Evans Hughes.

FAIRIES, *fair'iz.* In James M. Barrie's charming play of *Peter Pan,* when Peter advances to the footlights and says appealingly, "Do you believe in fairies?" grown people as well as children cry, "Yes! Yes!" and mean it, too. For the moment they do believe in fairies—the little beings are too beautiful, too delightful not to be real. To children at certain stages of their experience they are the most enticing, the most important inhabitants of the earth. Every flower cup may be a fairy's bedroom; every mushroom is a fairy's dining-table. The gauzy-winged butterflies are the fairies' airships, and very often in the woods and fields of a summer's morning may be seen the rings where their tiny feet have danced all night. True, the most watchful child has never caught a glimpse of one, but almost every child has felt many a time that he might have seen one had he turned about just a little more quickly. As the little girl in the song says:

> I know whenever fairies pass,
> Because they lightly bend the grass;
> I never see them, so I think,
> They must go by just when I wink.

Fairies do not like the cold, so they are not to be found in the fields in the winter, but there is one place where they can always be found, and ready indeed are they at all times to come out and play with the delighted children. From between the covers of the favorite fairy-tale book they glide, and with a wave of their wands carry the children with them to wonderful countries "that never were on land or sea." There is Cinderella's fairy godmother—she does not look much like a fairy, but what a powerful one she is, with her wand that can turn pumpkins into chariots! And Jack's fairy that he met at the top of the beanstalk—the beautiful lady with the star-tipped wand—what could he ever have done without her advice? Sometimes the fairies in these wonderful tales carry away a child from its wicked parents and bring it up happily among themselves; sometimes they bear away to their fairy home some man who deserves punishment, and there make his life a burden to him; or they make it possible for a poor little girl who is out tending the goats, and never has enough to eat, to spread for herself each day a fairy table with everything on it that she likes the most. One thing may be depended on—the true fairies are always found assisting the good people, and no one who is cruel or cross or greedy ever need look for any help from them. If the moral of these tales be very obvious, the children do not mind; that is the way, it seems to them, that the world should be managed.

Fairies may be of almost any size or appearance; indeed, they can look like anything they choose, changing between one moment and the next. A favorite device of a fairy who wants to find out about the worthiness or unworthiness of a person is to appear as a poor old woman seeking aid, and then, when she has found out all she wants to know, to throw off her disguise. The Irish, who seem to know the most about fairies, declare that they prefer to appear as tiny men and women, the men in gay attire of—

> Green jacket, red cap
> And white owl's feather;

the little ladies in gauzy gowns and bonnets made of flower petals. Long after children have ceased to believe that there actually are fairies they love to read of their marvelous doings and to satisfy their inborn sense of justice by gloating over the way the fairies always reward the good and punish the evil in the end.

Should Fairy Tales Be Told? There are people who do not believe in telling fairy stories to children, but the weight of opinion is all in the other direction. Educators hold that, besides giving pleasure, such stories perform a real service in stimulating the imagina-

tion; that they are the natural mental food of children or of older people in an earlier stage of development is shown by the way they have been built up.

Many of them are not artificial products, invented and written out at a sitting, but gradual growths which have been handed down for centuries by word of mouth. It seems as if people had the feeling that a certain element of wonder was necessary in the world, and knew no other way to introduce it. A message must be carried instantaneously from one kingdom to another; a prince must arrive at his realm, many miles away, before an hour has passed or he will lose his sovereignty —and how could these things be accomplished except through the aid of fairies? To-day the message could be sent by wireless telegraphy or by the telephone; the prince could board an express train or soar through the air in an aeroplane almost as swiftly as ever a fairy could carry him. Far more marvelous things than the most ingenious fairy chronicler ever conceived of happen every day, and are scarcely thought of; and a present-day number of a journal of science or invention would have seemed more fantastic to the reader of a century ago than do the tales of Grimm or of Andersen to-day.

The "Grown-up" Phase of Fairy Lore. Time was when sedate grown people believed in the "little folk," as the fairies were affectionately called, for without them they could not account for much that they saw in the world. Knowing little of science or of the laws of nature, they had to introduce supernatural agencies. If the cream turned sour over night, or if the butter would not "come," the housewife had offended the fairies, and they were taking their revenge; if a child sickened suddenly and died, the evil fairies were to blame. Gradually, as education spread, these beliefs passed away, but the delight of children in fairy tales had become evident, and people continued to tell them and to write them for that reason. Some of those which are read and loved to-day, as *Cinderella,* for instance, were written far back in the time when a belief in fairies was widespread.

Even to-day in most countries there are those among the peasant classes who cling to their belief in fairies or kindred beings. For the fairies are not the only class of sprites that figure in folklore. There are the *dwarfs,* or *gnomes,* clever, malicious little creatures that live underground and guard the jewels and metals there hidden; there are the *trolls,* little old men who live in the hills and steal forth to carry away children and valuable property; and the *nixies,* or water-sprites, who love to entice men into their caves in the sea. The famous Lorelei (which see) was one of these. Nations differ, too, in their ideas concerning fairies, those of Russia, for instance, being very different from the English fairies. Of these latter Shakespeare gives most charming pictures in his *Midsummer Night's Dream.* F.J.C.

FAIR'MONT, W. Va., noted as a coal-mining center, is the county seat of Marion County. It is situated in the northern part of the state, at the head of navigation on the Monongahela River. Morgantown is twenty-five miles northeast, and Wheeling is eighty miles northwest. The Baltimore & Ohio Railway, constructed to the city in 1852, and the Monongahela Railway, built to this point in 1915, afford railroad transportation, and interurban lines connect with cities north, west and south. The city's population, largely American, was estimated to be 15,506 in 1916, by Federal estimate; the census for 1910 gave a population of 9,711.

Fairmont occupies both banks of the river, the opposite sections being connected by a steel suspension bridge. The coal industry leads in its commercial activities, but the trade in glass products is also important and foundries, planing mills, machine shops, flour mills, cigar factories and pottery works are included in the city's industrial plants.

The most notable buildings are the Federal building, erected in 1914 at a cost of $125,000; the Marion County courthouse, erected in 1895 at a cost exceeding $350,000; the $350,000 Watson building, erected in 1910, and the high school building. Fairmont is the seat of the state normal school, which, with a business college and public library, supplements the public school system. The city has two hospitals; one, exclusively for miners, is maintained by the state.

In 1819 the site of Fairmont was laid out as Middletown, and in 1842 Middletown became the county seat of the newly-established Marion County. Two years later its name was changed to Fairmont.

FAIR OAKS, Battle of, also known as the **Battle of Seven Pines,** was an engagement of the War of Secession, fought during McClellan's Peninsular Campaign on May 31 and June 1, 1862. Fair Oaks was a station on the Richmond & York Railroad, seven miles east

of Richmond, and Seven Pines the name of a tavern on the battlefield. In the battle about 42,000 Federals under McClellan engaged an equal force of Confederates under Joseph E. Johnston and G. W. Smith. After the battle of Williamsburg, which occurred on May 5, Johnston began a slow retreat toward Richmond. McClellan, who was following him, threw his left wing, under Heintzelman and Keyes, across the Chickahominy.

On the morning of May 31 Johnston sent a Confederate force to attack this wing, and only the arrival of reënforcements under Sumner saved the Federals from a serious defeat. The Confederates were then driven back with heavy losses, Johnston himself being among the wounded, and General Smith taking chief command. On the following day, after the Federal left had repulsed an attack by Longstreet, General Robert E. Lee superseded Smith, and on the night of June 2 the Confederates withdrew to Richmond. The total Federal loss was about 5,000, and that of the Confederates, about 5,200.

FAITH CURE. This term, also known as mental healing and psycho-therapeutics, refers to the recognized influence of the mental attitude upon the bodily processes. The normal functioning of the processes of digestion, respiration and circulation, and that of all the complex chemical processes which determine energy and well-being, are peculiarly dependent upon the proper action of the nervous system; this last, in turn, is most intimately bound up with the attitudes of mind—hope, fear, apprehension, despondency, worry, attention to symptoms (pains). In addition, this mental factor is peculiarly prominent in certain forms of ailment known as functional nervous disorders. The disappearance of symptoms under strong mental stimulation is thus explained. The disorder known as hysteria provides the most favorable culture-bed for such effects. Hysterical symptoms are not the products of shamming, but of an exceptional suggestibility; impediments, in the form of conviction that muscles cannot be controlled, induce paralysis. The sight of disorder, as of twitching or convulsions, induces the same symptoms in the hysterical; nervous disorders may thus spread by contagion.

On the basis of such observation it follows that a strong belief in the power of a religious ceremony, the laying on of hands, prayer, the visit to a shrine, the touch of a relic, may release nervous impediments to health and prepare the way for a prompt or gradual improvement and cure. This influence may be traced in the history of miraculous cures from ancient times. J.J.

Relating to Various Beliefs. The articles on the following topics, while not bearing on Faith Cure, are of interest in this connection.

Alchemy	Palmistry
Astrology	Phrenology
Clairvoyance	Psychical Research
Conjuring	Psycho-Analysis
Demonology	Physiognomy
Divination	Spiritualism
Hypnotism	Suggestion
Magic	Superstition
Medium	Telepathy
Mesmerism	Theosophy
Mind Reading	Trance
Necromancy	Witchcraft
Occult	

FAKIR, *fa keer'*. Because of the resemblance between the word *fakir,* which comes from an Arabic word meaning *to be poor,* and the slang word *faker,* which is probably from an old English word meaning *to deceive,* most people have the erroneous impression that all fakirs are dishonest. India is the home of fakirs. There, some of them are ascetics who live in communities and are very devout Mohammedans; others are wandering beggars who torture themselves in all sorts of ingenious ways, either from sincerely ascetic motives or to convince the people of their holiness; still others are jugglers and sleight-of-hand performers, said to be the cleverest in the world. The first class probably constitutes the majority.

FALCON, *faw'k'n,* or *fawl'k'n,* a strong, graceful, powerful hawk, at one time widely used in hunting game. Its claws are sharp and hooked, its short, stout legs are heavily feathered, and its curved beak is armed with a sharp hook. The peregrine falcon, known in America as duck hawk, is the one preferred for hunting. Its upper parts are slate colored, the under parts cream, barred with dark slate or black, excepting the upper part of the breast. The female peregrine is most val-

THE FALCON

ued because she is so fierce, quick and perfect at the work of catching game. She is about seventeen inches long, with a forty-two-inch spread of wing. Falcons inhabit wild places and prey on grouse, ducks, pigeons, rabbits, etc. They usually build their nests on high ledges of rock. Other American true falcons are the pigeon-hawk and the sparrow-hawk.

Falconry or Hawking, an amusement of Oriental origin, is the pursuit of game by means of trained falcons or hawks. The falcons are taken to the field hooded and leashed, carried on the shoulder or wrist of the trainer or master, and when the game is seen the bird is unhooded and loosed. Having been trained, it catches the prey and, instead of devouring it, brings it to the master. Falconry was a favorite sport of princes, nobles and ladies in the Middle Ages, but in England it declined in the seventeenth century with changes in agricultural conditions and the introduction of firearms. The United States and Canada are well adapted to falconry, having the greatest variety of hawks and the best opportunity for flying them. Several clubs have been started to encourage the sport, but it does not give promise of becoming a popular pastime.

FALCONBRIDGE, *fawk'on brij,* Sir [William] Glenholme (1846-), a Canadian jurist, since 1900 chief justice of the king's bench of the supreme court of Ontario. Sir Glenholme was born at Drummondsville, Ontario, attended school at Barrie and Toronto, and in 1866 was graduated with honors from the University of Toronto. He was for several years a teacher of modern languages, but in 1871 was called to the bar, the profession in which he was destined to rise to the highest ranks. In 1872 he was appointed an examiner in his *alma mater,* and until 1881 was also registrar. From 1881 to 1896 he was a senator of the university. In 1887 he was appointed a judge of the queen's (now king's) bench, of Ontario, and since 1900 has been chief justice. From 1896 to 1900 he was an active member of the commission for revising the statutes of Ontario. Sir Glenholme is justly regarded as one of the great jurists of the Dominion, and is also known for his numerous translations from the Latin, Greek and German poets. The honor of knighthood was conferred on him in 1908. G.H.L.

FALCONER, *faw'k'ner,* Robert Alexander (1867-), a Canadian educator and clergyman, chosen president of the University of Toronto in 1907. He was born at Charlottetown, Prince Edward Island, was educated at Queen's Royal College, Trinidad, British West Indies, and later studied at the universities of London, Edinburgh, Leipzig and Berlin. In 1892 he was ordained a Presbyterian clergyman, and thereafter, until 1907, he was in turn an instructor, a professor and principal of Presbyterian College at Halifax. In 1907, the year in which he became president of the University of Toronto, he was also appointed to the joint committee to promote a union of the Presbyterian, Congregational and Methodist churches in Canada. Dr. Falconer is the author of *The Truth of the Apostolic Gospel* and numerous articles on New Testament subjects. He was created Companion of the Order of Saint Michael and Saint George (C. M. G.) in 1911.

FALCONIO, *fal ko'nyo,* Diomede (1842-1917), an American Roman Catholic cardinal, born at Pescocostanzo, Italy. After finishing his novitiate in the Franciscan Order in 1865 he emigrated to America at the age of twenty and became a naturalized citizen, this fact entitling him to recognition as an American by the Roman Catholic Church. He was ordained priest in Buffalo in 1866 and in the same year became professor of philosophy at Saint Bonaventure's College, Allegany, N. Y. From 1872 to 1882 he was administrator of the cathedral at Harbor Grace, Newfoundland, but returned to Italy in 1883 and held various high positions in the Church, including the archbishopric of Matera. He served as apostolic delegate to Canada from 1899 to 1902, and was then transferred to Washington in a similar capacity. On October 28, 1911, he was elevated to the cardinalate, being one of three American cardinals appointed at that time by the Pope, the others being John Murphy Farley and William Henry O'Connell. He is the author of a volume of *Pastoral Letters.*

FALKLAND, ISLANDS. *fawk'land,* The southernmost unit in the British Empire is the crown colony of Falkland Islands, which includes the islands proper, a rocky group 300 miles east of the Strait of Magellan; South Georgia and the Sandwich Islands, 1,000 miles farther east; and Graham Land, a part of the Antarctic continent, with the neighboring South Orkney and South Shetland islands. The chief industry of the 3,000 people in the Falklands is sheep-raising. South Georgia has a whaling settlement, the Shetlands have seal fisheries, and the Orkneys and Graham Land are the sites of Argentine meteorological stations.

Of the 6,500 square miles in the Falkland group, 3,000 are in East Falkland, which contains the capital, Stanley; 2,300 square miles are in West Falkland, and the remaining 2,200 are divided among a hundred smaller islands. South Georgia contains about 1,000 square

THE FALKLAND ISLANDS

miles; the South Shetlands, nearly 900, and the South Orkneys, about 800. The Falklands were discovered by the English Captain Davis in 1592, and have since been occupied by France, Spain, England and the republic of Buenos Aires. They have been an undisputed British colony since 1833.

FALLACY, *fal'a si.* When a father says, "I succeeded in getting through life with only an ordinary education, and therefore my children don't need anything better," he is guilty of a fallacy. This word comes from the Latin verb meaning *to deceive,* and is the name given in logic to a blunder in reasoning, whether deliberate or unintentional, that leads to a wrong conclusion. See Logic.

FALLIÈRES, *fal yair',* Clément Armand (1841-), a French politician, statesman and eighth president of the French Republic, was born of peasant ancestry in Mézin in the department of Lot-er-Garonne. He received his education in Paris, studied law and soon became conspicuous as a speaker and debater. In 1868 he entered political life and in 1876 was elected as a Republican to the Chamber of Deputies. He was appointed an undersecretary in the Department of the Interior in 1880 and became Minister of the Interior in 1882, subsequently becoming Minister of Public Instruction under Ferry. In 1890 he was elected Senator from Lot-et-Garonne, and in 1899 became president of the senatorial body, being elected eight successive times. The Socialists and Radical Republicans elected him as President of the Republic in 1906 to succeed Loubet, and he assumed office on February 18 of that year.

Because of his democratic ideas he was popular with the masses throughout his career and evinced a desire to give the laboring element greater recognition. In 1913 M. Poincaré succeeded him as President of the republic, and he retired to his estate at Loupillon in Southern France.

FALLING BODIES. From the time of Aristotle to the end of the sixteenth century it was believed that if two bodies of unequal mass were dropped from the same height at the same time, the heavier body would reach the earth first. An Italian named Galileo, who lived during the latter part of the sixteenth and through the first half of the seventeenth century, was the first man to disprove this theory. Others had questioned and disputed it, but Galileo decided to prove that Aristotle was wrong. Accordingly, about the year 1590, he went to the top of the famous leaning tower of Pisa and dropped at the same instant a small cannon ball and a large one. They reached the ground at nearly the same instant, so he came to the conclusion that it was the resistance of the air that made for difference in velocity and not the difference in weight. The dispute was not settled finally until after the invention of the air pump in 1660. Then it was shown that when a feather and a coin were dropped simultaneously in a long tube from which all the air had been pumped, they fell side by side and reached the bottom at the same instant.

The conclusion was then established that the force of gravity, which is the force that makes bodies fall towards the earth, acts on all bodies alike, regardless of their shape, size or density. Since the attraction of the earth is towards its center, all bodies move in a direct line towards that point. This line is exactly perpendicular to the surface of still water.

The first law of falling bodies states that, under the influence of gravity alone, all bodies fall with equal rapidity. Actually, because of the resistance of the air, bodies fall with different degrees of rapidity. You can test this resistance of the air for yourself by taking, for instance, two sheets from a newspaper and dropping one unfolded and one crushed into a ball from a second- or third-story window. Since both pieces of paper are of practically the same weight, you have a perfect illustration of the fact that it is difference of *shape* and not of *weight* that causes the difference in velocity.

There are three things to be considered in studying the laws of falling bodies. One is the *distance* the body falls—the actual number

of feet it travels; the second is its *velocity,* or rate of speed; and the third is its *acceleration;* for a body does not travel at the same rate of speed throughout its fall. The longer it falls, the faster it travels; that is, its velocity increases with every second that it falls. It has been found that the gain in speed of a falling body, its *acceleration,* in other words, is always the same for each second. The motion of a falling body is described, therefore, as *uniformly accelerated* motion. This means that it is a mathematically exact and unvarying motion, provided the object is acted on by the force of gravity alone. In discussing the laws of falling bodies, v will sometimes be used to represent velocity, a, acceleration, and d, the distance traveled.

It has been found that the acceleration imparted to a falling body is about thirty-two feet per second; the exact number is 32.16 feet. This never varies, therefore a always stands for 32.16. The velocity of a body at the beginning of the first second of its fall is 0; at the end of the first second, or the beginning of the second second, its velocity is 32.16 feet per second. In the second second, therefore, without taking acceleration into account, a body falls at the rate of 32.16 feet per second, the velocity at the beginning of the second. To get the total velocity at the end of the second, the acceleration must be added; therefore the velocity at the end of the second is 64.32 feet per second. Let us, then, state it in this way: the velocity of a falling body at the end of a given second is always the velocity at the beginning of that second, plus the acceleration.

At the end of first second v $(0+32.16)=32.16$ feet per second.
At the end of second second v $(32.16+32.16)=64.32$ feet per second.
At the end of third second v $(64.32+32.16)=96.48$ feet per second.
At the end of fourth second v $(96.48+32.16)=128.64$ feet per second.

The shorter mathematical formula for finding the velocity of a falling body at the end of any given second, is to multiply 32.16 feet by the number of the second. The result obtained would be the same, of course, as that obtained above by addition.

The distance traveled in a given second may be found from the average of the velocity at the beginning and the velocity at the end of the second, as follows:

$$\text{In the first second } d=\frac{0+32.16}{2}=16.08 \text{ feet}$$

$$\text{In the second second } d=\frac{32.16+64.32}{2}=48.24 \text{ feet}$$

$$\text{In the third second } d=\frac{64.32+96.48}{2}=80.40 \text{ feet}$$

$$\text{In the fourth second } d=\frac{96.48+128.64}{2}=112.56 \text{ feet}$$

By adding the distance traveled in each separate second, the total distance traveled can be found. In three seconds, therefore, a falling body travels $16.08+48.24+80.40=144.72$ feet. Now, 144.72 may also be divided up in this way: $3\times3\times16.08$. The total distance traveled in four seconds, 257.28 feet, may be divided thus: $4\times4\times16.08$. So a shorter mathematical formula has been worked out which states that the distance a falling body travels in a given time may be found by multiplying 16.08 by the square of the number of seconds. This rule you can prove for yourself by the longer formula just outlined.

The shorter mathematical formula for distance per second is stated in this way: To find the distance a body falls in any given second,

The illustration shows the length of time required for a body to fall from the top of the building to the ground. From the explanation of the laws of falling bodies, as given in the text, and with the help of the formulas in the diagram, the height of the building and the distance the body falls each second may easily be computed by the reader.

multiply the distance it falls the first second by twice the number of seconds, minus one. The distance a body falls in the third second is $(2\times3-1)\times16.08=80.40$ feet; in the fourth second, $(2\times4-1)\times16.08=112.56$. This tallies exactly with the results obtained in the longer formula given above. See GRAVITY; GRAVITATION. C.R.M.

FALL LINE. When the headwaters of a river are in a rocky region and its lower course is through softer soil, falls or rapids will be formed where it passes from the one to the other. Where the coast of a country is a plain, as it is in much of the Atlantic region of the United States and Canada, there will be a sudden drop in the bed of each river which flows into it from the more mountainous interior. Thus the border of the coast region becomes a *fall line,* or line of falls. Both because of the abundance of water power and because it marks the limit to which ships can ascend the rivers from the ocean, the fall line is the location of many important cities. The most important of these in America are shown on the accompanying map.

THE FALL LINE
The dots represent cities extending from Quebec, Canada, to Columbus, Georgia. These cities can be identified by comparison with political maps.

FALL RIVER, MASS., one of the largest cotton-manufacturing cities in the United States, situated in Bristol County, in the extreme southeastern section of the state. It is on Mount Hope Bay, an inlet of Narragansett Bay, at the point where it receives the waters of the Taunton River. Boston, the state capital, is forty-nine miles north; Providence, R. I., is eighteen miles northwest. Transportation facilities are provided by the New York, New Haven & Hartford Railway, by extensive electric interurban lines and by the steamers plying regularly between Fall River and other Eastern cities; freight steamers communicate daily with Providence. In 1910 the population was 119,295; in 1916 it was 128,366.

Fall River has a safe, deep harbor, capable of admitting vessels of the largest size. Water power for manufacture is supplied by Fall River, which rises in Watuppa Lake, on the eastern limits of the city, and has a descent of 130 feet in half a mile. Large capital has been invested in the kindred cotton industries, which make thread, yarn, calico, prints, ginghams and knit goods; more than 35,000 people are employed in these factories. Besides cotton products, the city makes woolen goods, men's hats, especially those for the United States army, spools, bobbins, cotton-making machinery supplies, rope, twine and rubber. Granite quarrying within the city is also an important industry. There are a number of fine structures built of this native stone, one of the most notable being the city hall. Other noteworthy buildings are the customhouse and post office, the Durfee high school, the Technical high school and the state armory. In addition to its public schools the city has Notre Dame College, a conservatory of music, a free textile school, opened in 1904, and a library with 70,000 volumes. There are hospitals and homes for children and for the aged. Five parks provide recreation grounds.

The first settlement made here by white men was on land obtained by treaty with the Wampanoag Indians. It was a part of Freetown until 1803, when it was incorporated separately. From 1804 until 1834 it was known as Troy. In 1854 it was chartered as the city of Fall River, and in 1862 a part of Tiverton, R. I., was included within its limits. The most serious strike in the history of the textile industry occurred here in 1904.

FALSE IMPRISONMENT, the detention or confinement of a person without authority of law. An example of false imprisonment develops in case one person by false swearing secures the detention of another. If the victim is able later to establish the facts he may proceed by criminal prosecution to secure the punishment of all who conspired against him. Only when a disturbance of public peace or safety has been committed is the imprisonment of a citizen justifiable.

False imprisonment does not arise in case a man is found guilty by a jury, is sentenced to prison and is afterwards proved innocent. The victim in this case has no redress.

FAMILY. See CLASSIFICATION, subhead *Family.*

FAMINE, *fam'in,* a great scarcity of food which causes suffering and death among many inhabitants in a country. The chief causes are destructive floods or the lack of rain, devastating wars, and injurious insects such as the locusts which travel in such swarms that they may ruin crops wherever they go. In early history famines were more common than they are to-day, for transportation and lines of communication were not developed, so when crops failed people could not quickly obtain supplies from more favored districts.

The worst famines in history have been in India and China. English rule has helped India, for the government has set aside an amount of money annually to be used, if needed. In China a great famine occurred in 1877, in which over 9,000,000 people perished; in 1902 there was another, which killed over 1,000,000. In India several have occurred; one visited the country in 1837, when 800,000 perished; another, in 1865, when over 1,000,000 died; and yet another, in 1900, in which about the same number starved to death. During the War of the Nations, Belgium, Serbia and Poland were on the verge of famine before supplies reached them from benevolent neutral countries, but relief was sent in time to save many thousands of the unfortunates.

FANDANGO, *fan dang'go,* one of the three modern national dances of Spain, the other two being the *bolero* and the *seguidella.* These first came into prominence in the sixteenth century. The fandango is danced by two people in 6-8 time, beginning slowly and gradually increasing in speed, until they end in a whirl. Marked by the snapping of fingers, stamping of feet and the clicking of castanets, which are held in the hands of the performers, the dance is lively and full of exultation. A feature of the fandango is a sudden pause of the music towards the end of each measure, upon which the dancers stop in a rigid pose until it starts again.

FANEUIL HALL, *fan'l,* an historic building in Boston, popularly called "the Cradle of Liberty." For description and illustration, see BOSTON.

FARAD, *fair'ad,* the unit of capacity in electricity, named for the great scientist, Michael Faraday. By reference to the article LEYDEN JAR, it will be seen that a charged condenser has a potential power. If one *coulomb* of electricity gives a condenser a potential force of one *volt,* the capacity of the condenser is one *farad.* See ELECTRICITY.

FARADAY, *fair'a day,* MICHAEL (1791-1867), an English chemist and physicist, one of the world's greatest electricians. The taming of electricity to act as man's servant, more powerful than Aladdin's slave of the lamp, was in large part his work.

MICHAEL FARADAY
In middle life.

Faraday was born at Newington Butts, near London, of a poor family. After little schooling he was apprenticed to a bookbinder, but he had very definite ambitions and spent his leisure time reading scientific works and making experiments in electricity, with an old bottle for a battery. The great name in science in the England of that day was Sir Humphry Davy (which see), and in 1812 Faraday had the joy of hearing the distinguished chemist lecture. His notes on the lectures so aroused the interest of Davy, to whom they were submitted, that he made young Faraday his assistant at the Royal Institution. For fifty-four years Faraday was connected with that scientific body, winning constantly greater honors and higher rank.

He made a number of important discoveries in chemistry, his reduction of certain gases to liquid form by pressure being especially noteworthy, but these all sank into insignificance beside his electrical discoveries. Of them the greatest was that of the connection between electricity and magnetism, which had as its practical outcome the production of electric currents by means of a magnet. Because of this discovery the unit for measuring electric current capacity was called a *farad.* Faraday published numerous works dealing with various phases of science, the most important of which are *Experimental Researches in Electricity* and *Researches in Chemistry and Physics.*

FARCE, a form of dramatic composition in which the author has but one purpose, to provoke laughter by means of exaggerated and ludicrous situations. No pretense is made of presenting characters that are true to life, for, in a farce, character is entirely subordinate to plot. Pure comedy often has farcical ele-

ments, but this form of drama is distinguished from farce in that its plot is worked out through the truthful portrayal of character.

FARGO, N. D., the largest city of the state, an important distributing center and the county seat of Cass County, situated on the Red River, on the eastern border of the state. Railway service is provided by the Northern Pacific Railway, constructed to the city in 1875; by the Great Northern, built in 1881, and by the Chicago, Milwaukee & Saint Paul. Moorhead, Minn., across the river, has electric railway connection with Fargo. Bismarck is 197 miles west; Winnipeg, Man., is 226 miles north; Saint Paul, Minn., is 242 miles southeast, and Duluth, Minn., is 254 miles directly east. The city was settled in 1871, was incorporated in 1875 and named in honor of W. G. Fargo of the Wells Fargo Express Company. In 1912 the commission form of government, with five elective officers, was adopted. The population was estimated to have increased from the official count of 14,331 in 1910 to 17,389 in 1916, as estimated by the Census Bureau.

Fargo is a city of fine streets, beautiful parks and attractive homes. Island Park, containing thirty-five acres; South Park, thirty-five acres; and Oak Grove, thirty acres, are the pleasure resorts of the city. It is the seat of the State Agricultural College, Fargo College, Oak Grove Seminary and Sacred Heart Academy. These, with two business colleges, public schools and a Carnegie Library afford excellent educational advantages. A $150,000 Federal building, a $100,000 courthouse, a $95,000 auditorium, a $90,000 jail, a Roman Catholic cathedral, a Protestant Episcopal cathedral and the Ford Building, erected in 1914 at a cost of $150,000, are the most notable structures. A Federal land office is located here.

The city is situated in the heart of a fertile agricultural region, which produces great quantities of wheat, hay, flax and oats. As a distributing point for heavy farm machinery, it ranks possibly second in the United States. There are more than a hundred wholesale and distributing houses, and large shipments go to Canada as well as to points in the United States. Of its many and varied industrial establishments knitting mills, foundries, creameries, bottling works, cracker factories and automobile plants are the most prominent; the city is also actively engaged in the manufacture of bed springs, mattresses, harness, trunks and artificial limbs. There are also car-shops of the Northern Pacific Railway. The city sustained a loss of $2,500,000 in 1893, when the business portion was destroyed by fire. J.P.H.

FAR'GUS, Frederick John (1847-1885), an English novelist whose works were published under the pen name Hugh Conway. He took the second part of the name from that of the *Conway,* an English ship. He was born in Bristol and served in the navy before he became an author. Fargus is remembered chiefly for a sensational novel, *Called Back,* which circulated widely in Europe and in America and was also successfully dramatized. It was first published in 1884. Other books written by him are *Dark Days, Slings and Arrows* and *Bound Together.*

FARIBAULT, *fair'i bo,* Minn., the county seat of Rice County, situated in the southeastern section of the state, on Cannon River, at the point where it receives the waters of the Straight River. Saint Paul is fifty-two miles north. Faribault is a railroad center of importance in this section of the state, being the junction of the Chicago, Milwaukee & Saint Paul, the Chicago Great Western and the Chicago, Rock Island & Pacific railways; an electric line extends north to Saint Paul. In 1910 the population was 9,001; in 1916 it was estimated to be 9,712.

Faribault is located in a region dotted with beautiful lakes, and enjoys considerable popularity as a summer resort. The city has ample water power and produces a variety of products, the leading manufactures being furniture, rattan goods, butter tubs, wagons and woolen goods. There are in addition canneries, breweries and planing mills. In its territory, Faribault is an educational center of prominence, having the state schools for the deaf, the blind and the feeble-minded, Shattuck Military School, Seabury Divinity School, Saint Mary's School, and Bethlehem Academy. The city also has a public library.

The first permanent settlement was made in 1853 and named in honor of Jean Baptiste Faribault, a French fur trader. The city was chartered in 1872 and since 1911 has been administered on the commission plan. Faribault was the home of Bishop Whipple, who labored many years among the Indians.

FARLEY, *fahr'li,* John Murphy (1842-), an American Roman Catholic cardinal, born at Newton Hamilton, County Armagh, Ireland. He received his early education in Ireland under a private tutor and was confirmed

at the age of seven, this privilege being granted for his thorough knowledge of the Catechism. In 1860 his family emigrated to America, and he entered the college of Saint John in Fordham, N. Y., from which he was graduated in 1866; afterward he studied at Saint Joseph's in Troy. His ordination took place in 1870 at the American College in Rome, where he had gone to complete his theological studies.

CARDINAL FARLEY

After his return to America he became secretary to Cardinal McCloskey, and in 1884 was appointed private chamberlain, or official to regulate the Vatican ceremonies, for Pope Leo XIII, and was given the title Monsignore. In 1891 he was appointed vicar-general of the New York archdiocese and in 1895 was made assistant to the archbishop. In 1902, he became the fourth archbishop of New York. At the consistory in Rome in 1911 he was one of the three American archbishops to receive the appointment of cardinal, the others being Diomede Falconio and William Henry O'Connell. He is the author of several historical and controversial works, including a *Life of Cardinal McCloskey* and a *History of Saint Patrick's Cathedral.*

FARM CREDITS. See RURAL CREDITS.

FARMERS' ALLIANCE. See POPULIST PARTY.

FARMERS' INSTITUTE, a meeting of farmers for their mutual benefit and improvement, developed on the general plan of teachers' institutes. In one form or another, usually under the auspices of local agricultural societies, such meetings were held in the United States over a century ago, but it was not until the years following the passage of the Morrill Act of 1862 that they began to take the present name and to receive the support of the states or of the state agricultural colleges. The Massachusetts State Board of Agriculture held a four-day meeting, the first open to the public, in 1862, and four years later the Connecticut State Board of Agriculture held its first farmers' convention. In 1871 the Massachusetts board requested the numerous agricultural societies of the state to hold annual meetings, to be called the *Farmers' Institutes of Massachusetts;* this seems to have been the first use of the name.

Since 1871 the farmers' institute has spread to nearly every state in the Union and to several of the Canadian provinces. A feature of the Canadian system, in the Western provinces, is the use of a special train to convey the institute conductors and their exhibits to every corner of the land reached by the railroads. In the United States, the farmers' institutes are usually under the direct management of the state agricultural colleges or of the boards of agriculture. Wisconsin and a few other states have a special officer, called the superintendent of farmers' institutes, to plan and manage them. It has been estimated that at least 8,000 institutes are held in the United States alone each year.

Among this large number there is necessarily much variety in the character of the meetings. They may last but a day or even half a day, or may continue for several days. The tendency is to shorten the meetings and to have them frequently. The winter, when the farmer's work is lightest, is the season for most institutes, but very successful meetings have been held at other times. The programs are always arranged to give the members abundant opportunity for informal discussion, in addition to addresses delivered by specialists or successful farmers whose reputation is more than local. At the longer meetings it is customary to provide music and other exercises. Young people's institutes and courses of instruction by correspondence are newer developments in the instruction of farmers. W.F.Z.

FARNESE, *fahr na'sa,* the name of an ancient Italian family whose wonderful palace in Rome, built by Pope Paul III, was a treasure house of art. Many beautiful pieces of statuary, such as the *Farnese Bull, Juno* and *Hercules,* which were in the palace, have been moved to the National Museum at Naples, and now only a few classic works remain in its halls.

The family was prominent in the thirteenth century, and in 1534 ALESSANDRO FARNESE, who was then a cardinal, became Pope Paul III. His grandson, Alessandro (1547-1592), after being educated at the royal court at Madrid, became a great general in the Spanish service and, although severe in discipline, was worshiped by his soldiers. He was the famous Duke of Parma, who fought in the Netherlands. In 1714 ELIZABETH FARNESE married

Philip V of Spain, and being naturally of a domineering and ambitious disposition, she completely ruled the king. In 1731 the male line became extinct at the death of Antonio.

The palace of the family in Rome, completed in 1575, was owned by the Pope for many years, and then it became the property of the king of Naples. At present it is the residence of the French ambassador to Italy.

Farnese Bull, a group of colossal statuary, represents Dirce about to be bound to the horns of a bull by Zethus and Amphion, the two stepsons of Antiope, for whom Dirce had decreed a similar fate. Antiope stands passively in the background. The group was made by two brothers, Apollonius and Tauriscus of Tralles, in the second century B. C. and, excepting the Laocoön, is the most important surviving work of the Rhodian school of art.

FARNHAM, *fahrn'am,* the county town of Missisquoi County, Quebec, and an important railroad center. It is situated in the extreme southern part of the province, on the Tamaska River, eighteen miles from the United States boundary line. Montreal is forty-three miles northwest, and Saint Hyacinthe is twenty-five miles north. Transportation service is provided by the Stanstead, Shefford & Chambly and branches of the Canadian Pacific and Central Vermont railways. The population, which is chiefly Canadian, was 3,560 in 1911; in 1916 it was about 3,800.

Tobacco is one of the crops of the country around Farnham, and many of the people in the town are engaged in making tobacco products. Car repair shops of the Canadian Pacific Railway are located here; there also are tanneries, shirt and overall factories, manufactories of safes and vaults, building materials and furniture; other industries are grist mills, butter and cheese factories and marble works. Farnham has a town hall, an electric power house, a $15,000 post office, a hospital and a large railway station; these are noteworthy, considering the size of the town. In addition to public and private schools there are a Roman Catholic college, a convent and a public library. A military camp and an experimental farm, in which $20,000 have been invested, are located here.

FAROE, *fa'ro,* **ISLANDS,** (in Danish, Faeröer), a group of twenty-one volcanic islands belonging to Denmark, lying in the North Atlantic Ocean, between Iceland and the Shetland Islands. Only seventeen are inhabited, the remainder being barren, rocky islets, all covering an area of 541 square miles. The coasts are precipitous, deeply indented and surrounded by treacherous currents which make navigation difficult. The principal islands are Strömö, Osterö, Vaagö, Bordö, Viderö, Sandö and Süderö. The inhabitants—hardy, vigorous Norsemen—are chiefly engaged in fishing and sheep raising. Vast numbers of sea birds nest on the precipices and yield a large revenue to the islanders, their eggs and feathers finding a ready market.

The islands are governed by a parliament, or *lagthing,* of eighteen members and a governor appointed by the crown of Denmark. There is representation in the Danish Parliament. Thorshavn, on the island of Strömö, is the seat of government. Population in 1911, 18,000, an increase of 2,770 since 1901.

FARRAGUT, *fair'a gut,* David Glasgow (1801-1870), an American naval officer whose brilliant and daring exploits during the War of Secession inspired Congress to create expressly for him the grades of vice-admiral and admiral. At the age of seven he was adopted by Commander David D. Porter (which see), and two years later entered the navy as a midshipman. He served with credit during the War of 1812 and the Mexican War, and between 1854 and 1858 was occupied in establishing the Mare Island Navy Yard in San Francisco Bay.

DAVID G. FARRAGUT

The outbreak of the War of Secession found him on duty at the Norfolk Navy Yard. Having offered his services to the North, he was put in command of a blockading squadron late in the year 1861, and ordered to unite with Porter in the capture of New Orleans. A fierce bombardment of the forts guarding the approach to the city being without result, Farragut ran the enemy's batteries, defeated a Confederate fleet of fifteen vessels, and on April 27, 1862, took formal command of New Orleans. This triumph won him the rank of rear-admiral.

In 1863 he gave valuable assistance to Grant's land forces engaged in the siege of Vicksburg, and the following year took command of a fleet of twenty-five vessels assem-

bled for the capture of Mobile (see MOBILE BAY, BATTLE OF). His storming of the forts and his victorious fight against the Confederate fleet in the harbor, during which he was lashed to the mast of his flagship, was one of the most stirring incidents of the war. This engagement marked the end of his active service. Farragut was created vice-admiral in 1864 and admiral in 1866 (see ADMIRAL).

FARRAR, *fair'ar* (pronounced by herself *fahr rahr'*), GERALDINE (1882-), one of the few American grand opera singers who have risen to fame, was born at Melrose, Mass. She was graduated from the Melrose public school, and received her musical education in Paris and Berlin. Her debut was made in 1901 at the Royal Opera House, Berlin, as Marguerite in *Faust*. She then became a member of the Berlin Royal Opera Company, and, after 1906, of the Metropolitan Opera Company of New York. Her soprano rôles include Marguerite, Madame Butterfly, Manon, Juliette and Tosca, in all of which she has been enthusiastically received. In 1915, by appearing as Carmen for a moving-picture company, she made it possible for future generations to possess a knowledge of her art as an actress. It is declared she received $30,000 for six weeks of this service. In March, 1916, Miss Farrar was married to an actor, Lou Tellegen.

GERALDINE FARRAR

FARRELL, *fahr'el,* PA. (until 1912 known as South Sharon), a city in Mercer County, near Sharon (which see), and near the center of the western state boundary. Farrell is on the New York Central and the Pennsylvania railroads, and has coal-mining and stone-quarrying interests, steel, iron and tin-plate works, and manufactories of chains, stoves, brass and explosives. The population in 1910 was 10,190.

FAR'THING, a bronze coin of the lowest value in English currency. It represents one-fourth of a penny, or the 960th part of a pound sterling. In United States or Canadian money it equals half a cent. The farthing was first issued in the reign of Edward I, and until the reign of Queen Mary it was a silver coin. It is still in circulation, but is scarce except in the poorer quarters of large cities. In large stores, if change includes a farthing, the purchaser is usually given a small packet of pins, a pencil or some other article instead of a coin.

FASCES, *fas'eez,* in the political history of ancient Rome, a bundle of birch or elm rods bound together by a red thong, in the middle of which was an ax. Servants called lictors carried fasces in advance of the king as a symbol of his power to punish by flogging and by putting to death. At the time of the republic they were carried before the consuls and praetors, and later, before the emperor. For illustration, see LICTORS.

FASHION, *fash'un,* a word from the Latin *factionem,* meaning *the make of anything,* is a term applied to styles of dress in vogue for a limited period. Fashion bears about the same relation to costume that weather does to climate, the first in each case being variable and temporary, the other constant and permanent. To appear well dressed one must conform more or less to prevailing styles, for, as Alexander Pope says in his *Essay on Criticism*—

> In words, as fashions, the same rule will hold,
> Alike fantastic, if too new or old.

For centuries men of fashion have looked upon the costume-makers of London as the guardians and creators of correct styles in dress; social leaders among the women have accepted Paris as the fashion center of the world. These arbiters of fashion are not, however, the only factors in determining the style of dress. New modes of living are reflected in contemporary costume, the popularity of the automobile, for instance, making fashionable the tourist's bonnet and veil. Events of world-wide importance which engage the attention of large numbers of people are frequently responsible for fancies in dress. The Balkan War in 1912 started the vogue of Bulgarian colors in men's neckties and women's hat trimmings, and soon after the outbreak of the War of the Nations, in 1914, women began wearing tailor-made suits modeled on the military coat of the soldier. In 1915-1916, full short skirts, reaching to the shoe tops, became popular, a style adapted, it was said, from the uniform of the French hospital nurses in the war.

Books and plays have been known to inspire new styles of dress, one of the most interest-

ing examples being the adoption of the "Lord Fauntleroy" suits for small boys, when Mrs. Frances Hodgson Burnett's *Little Lord Fauntleroy* became popular. Later the artist Outcault, with his *Buster Brown* pictures, created a furore in behalf of "Buster Brown" suits for little boys. Fashion also dictates how men and women shall wear the hair, and there are even varying styles of walking. It is the exceptional community in which may be seen year after year an unchanging style of dress. In some districts of Holland, however, the people still wear the quaint Dutch costume adopted by their forefathers three hundred years ago, and the peasants in some of the mountainous sections of Central Europe likewise adhere to a costume that is centuries old. See Costume; Dress; Domestic Art; Home Economics; Sewing.

FASHODA, *fa sho' da.* See Kodok.

FAST'ING, voluntary or enforced abstinence from food and drink. Few human beings have survived for more than a week when totally deprived of both liquids and solids. When water is supplied, life may be prolonged many days. It is generally believed that death from starvation occurs after a loss of four-tenths of the weight of the body. Succi, an Italian, Doctor Tanner of the United States, and several others, are reported to have survived fasts of forty days each, during which time only water was taken into the system. Animals, particularly the hibernating species, endure fasting for longer periods (see Hibernation). Experiments have shown that dogs live from thirty to thirty-five days when deprived of both food and drink. Fasting for short periods is now successfully employed in modern medical science in the treatment of certain physical disorders, such as indigestion and some forms of fever. J.H.K.

FASTS, total abstinence from food on fixed days, particularly as a religious observance. The practice is common in many religions. The Mohammedans fast from sunrise to sunset during their entire month of Ramadan, or ninth month. The law of Moses prescribed an annual fast on the Day of Atonement, and modern usage includes the eves of the principal Jewish feasts. The Roman Catholic fast days are, strictly speaking, the forty days of Lent (Sundays excepted), the Ember days, the Wednesdays and Fridays of Advent and the vigils, or eves, of certain feasts. There is a distinction between *fasting* and *abstinence,* the former implying total abstention from food and drink, and the latter, refraining from meat only, or from meat and fish at the same meal. The Roman Catholic laws governing fasting, which formerly were very rigid, have been relaxed somewhat, allowance being made for the individual's state of health and the amount of work to be performed by him.

FAT, one of the component parts of all animal and vegetable bodies. The fats in man and other animals and in vegetables are chemically similar, and are compounds of a base of glycerine, with oleic, stearic and palmitic acids. Fats may be divided into three classes, namely, hard, soft and liquid. The hard fats include human fat, the fat of beef and mutton, wax and spermaceti. Soft fats include lard and butter; liquid fats include all vegetable and animal oils which remain in a fluid state at ordinary temperatures.

Fat is an important part of an animal organism. As a poor conductor of heat it preserves the natural heat of the body and also acts as a reserve capable of generating bodily heat by combustion within the animal organism. The fats in the human body are mostly taken into the system already formed in food (see Food). As an article of diet fat is essential. It is a heat producer, and should be eaten primarily to keep the internal fires active. Both fats and carbohydrates (which see) take high rank as sources of heat. In cold countries fat is more necessary than in warm climates. In summer it should be eaten sparingly, as the demand for heat is then small. In winter a fatty diet enables the body to maintain a sturdy resistance to cold and chills. The Eskimo who eats plentifully of fat or tallow at a meal is not merely satisfying an apparently uncultivated taste; he is laying up a store of necessary heat. The fat pork seen daily on the tables in lumber camps of the north is for the same purpose.

Fat is the base of all soaps, and is largely used in the manufacture of candles. In cooking fat is also of great value. It can be raised to a very high temperature without boiling, and food cooked in fat is covered with a thin film which prevents the escape of nutritious juices.

How to Reduce Fat. Excessive accumulation of fat is a source of discomfort to many persons, and various methods of reducing the weight have been carefully worked out by dietists and physicians. The so-called "fat cures," frequently advertised and placed on the market, are in almost every case worthless

and fraudulent. It may be said, in general, that the amount of fat can be reduced by decreasing the food and increasing one's physical activity, or both. The principle used in dieting is that the diet should be so regulated that the body is compelled to draw on its reserve stores of fat. According to one system, the total quantity of food is reduced, liquids are taken in limited amounts, and fats and carbohydrates are eliminated. Another method excludes carbohydrates, but retains fats. Each person must follow the method best adapted to his particular case. J.H.K.

FATALISM, *fa'ţ'lizm,* the belief that all events are always prearranged and determined by fate, implying either divine will or physical causes as the underlying force. In other words, a fatalist is disposed to accept every event in human life or in nature as preordained and controlled by fate, thus eliminating freedom of will.

THE THREE FATES

* * * And sing to those that hold the vital shears;
And turn the adamantine spindles round,
On which the fate of gods and men is wound.
—MILTON: *Arcades.*

FATES, *faytz,* three goddesses who were supposed by the Greeks and Romans to preside over human destinies and spin the thread of life. Originally the three were said to exercise their powers collectively, but later legends divided them, alloting certain tasks to each. *Clotho,* the spinner, spun the thread of life; *Lachesis* traced the fate of man; *Atropos* cut the thread of life with the shears of destiny. In ancient art *Clotho* was usually distinguished by a spindle, *Lachesis* by rods held in her hand, from which she drew the lot of man; *Atropos* held in her hand a roll or tablet on which she recorded the fate, or depicted by pointing to a sun-dial the hour at which man must meet his death. The accompanying illustration shows a more modern conception of the Fates. Clotho stands spinning the thread, which is passed to Lachesis, who is to twist it and decide how long it shall be. Atropos waits with shears ready to cut the thread. The Fates were gloomy, unsympathetic goddesses, inflexible in purpose, worshiped and propitiated as beings who punished man but never conferred blessings.

FATHER, a title of honor bestowed upon those of an earlier day who distinguished themselves as creators in some form of human endeavor, or who were associated in an exceptional way with important historic events. It is a title decreed by custom only. The following list is representative of the eminent men on whom the title of Father has been conferred:

Father of America. Samuel Adams, one of the most energetic of the American patriots in the movement for independence.

Father of Angling. Izaak Walton, the author of a charming discourse on the delights of fishing, entitled *The Compleat Angler* (1653).

Father of Comedy. Aristophanes, the greatest of the Greek writers of comedy.

Father of English History. The Venerable Bede, author of an *Ecclesiastical History of the English People.*

Father of English Poetry. Geoffrey Chaucer, whose celebrated *Canterbury Tales* gave English verse a standard literary form.

Father of English Pottery. Josiah Wedgwood, who made the manufacture of pottery in England an art. See WEDGWOOD WARE.

Father of English Printing. William Caxton, who introduced printing into England in 1476.

Father of English Prose. Alfred the Great, who inspired and partly wrote the first English history which appeared in the native language.

Father of Epic Poetry. Homer, the traditional author of the celebrated Greek epics, the *Iliad* and the *Odyssey.*

Father of Greek Tragedy. Aeschylus, the first great writer of Greek tragedy.

Father of His Country. George Washington is the "Father of his Country" to every American. This title has been conferred upon various other men of historic importance; Cicero was hailed as the Father of his Country when he saved the

Roman state from the conspiracy of Catiline, and the title was also borne by Julius Caesar and the Emperor Augustus.

Father of History. Herodotus, the first Greek historian.

Father of Medicine. Hippocrates, a Greek physician, the most celebrated of ancient times.

Father of the Faithful. Abraham, the ancestor of the Hebrew race.

Father of Lies. A title of scorn that is applied to Satan, the evil spirit who is said ever to be working to lure mortals into lives of sin.

Father is sometimes used in a figurative sense, as in the expression *Father of Waters,* applied to the Mississippi, the river of numerous tributaries.

Each man named above is described in detail in alphabetical order in these volumes.

FATHOM, a measure of length or depth equal to six feet. It is used only by those who "go down to the sea in ships," and only to measure the length of ropes or cables and the depth of water. Sailors of average height often measure rope by extending both arms at full length, from finger tip to finger tip being reckoned as a fathom.

FATIGUE, *fa teeg',* weariness from long-continued labor, either mental or physical. Fatigue invariably follows a long period of effort. It diminishes one's ability to perform a given act. In general one works more rapidly and with a greater degree of accuracy in the early part of the day than late in the afternoon, especially if he has been engaged in the same occupation all day. A careful study of the work of school children shows that they are unable to accomplish as much in the afternoon as in the forenoon session. Fatigue may be in one organ or one part of the body, or it may be general. A man driving nails will soon say that his arm is "tired," if such work is new to him. Another who has been engaged at hard labor through the day may say that he is "tired all over." Long continued use of the eye tires the centers of vision; a given sound becomes less acute after one has listened to it for a long time.

Causes of Fatigue. Muscular fatigue is caused by the accumulation of poisonous substances (toxins) which are thrown off by the muscle in action. This material is waste or worn-out matter which is thrown off by muscular action faster than it can be carried out of the system through the circulation. A period of rest restores the muscles to their normal condition. Another cause of fatigue is lack of sufficient supply of nutriment by the blood. One whose blood is deficient in nutriment becomes fatigued much quicker than one whose blood is in a normal condition.

The causes of mental fatigue are not as well understood, but so far as conclusions have been formed they are similar to those connected with muscular fatigue. In general, we know that mental effort can be sustained much longer than can muscular effort. We also know that the pursuit of a subject in which one is interested causes less fatigue than one in which the person is not interested. Fear, anger and worry are especially exhausting, and should be avoided. For this reason parents and teachers should study to keep the children under their care in a happy frame of mind.

Evil Effects. Fatigue following work is not injurious, since a period of rest restores the system to its normal condition. However, when one becomes so fatigued that the ordinary period of rest does not restore the system, one is in a condition which needs attention, for fatigue is nature's warning that rest is needed. Concerning this an eminent authority says: "Sensations of fatigue and pain are friendly voices of warning. They are the body's conscience. We should heed their message and not silence their prayer by stimulants, narcotics and pain-killers."

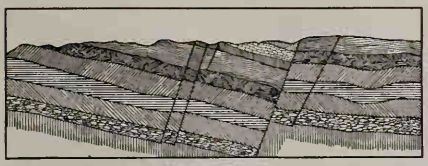
A little fatigue is easily overcome, if proper rest is supplied immediately. Twice the amount of fatigue requires more than twice the amount of rest. Unless this rest is secured disastrous results are likely to follow. It is the tired engineer who runs past the signal; the tired motorman who has a collision; the tired operative who is injured by his machine, and the tired and overwrought parent or teacher who unjustly punishes the child.

Realizing the loss from fatigue, large firms make careful study of methods for saving their employees all unnecessary movements, and for providing adequate rest periods. Educators so plan the daily program of the school that subjects requiring the greatest effort are placed in the early part of the day, and that the pupils are given frequent rest periods.

Fatigue is lessened by good health, a peaceful mind, simple living, interesting work and regular habits. W.F.R.

FAULT, *fawlt.* Since the rocks of the earth's crust were formed many of them have been bent, folded and broken. In mountainous regions there are frequent fractures in layers of rock, where the layer on one side of the fracture is above or below the same layer on the other side. Such a change of position

forms what the geologist calls a fault. In the diagram, at the right is shown the different layers of rock in the position in which they were formed; at the left are sections after they have dropped to a lower level. The fault



A FAULT

is at the fracture, to the right of the center of the illustration. Faults are frequently found in mines, for some of which they serve as natural drains.

FAUNA, *faw'na,* the collective name given to the entire range of animal life of any certain part of the world, or of a definite period of time. It corresponds to the word *flora,* which signifies the vegetation of the place or time. The region characterized by certain fauna is called *faunal region,* and may be large or small; for instance, one may speak of the fauna of North America, or of the fauna of any one state or province.

The name originated in the *Fauna* of Roman myths, the goddess of fields and flocks.

FAUNS, *fawnz,* in Roman mythology, the deities of the woods and herds, represented as half human, with pointed ears, short horns, a tail and cloven feet. A notable illustration is the marble *Faun of Praxiteles,* in the Capitoline Museum at Rome, the original bronze of which is doubtfully attributed to the famous Greek sculptor of that name. This statue figures in Hawthorne's *Marble Faun.* See PRAXITELES, for illustration.

FAUST. To many people Faust is simply the hero of Goethe's great drama of *Faust* and of Gounod's famous opera which is based on it, but such a character has no more real existence than Prospero in Shakespeare's *Tempest,* for instance, or than the hero of *Gulliver's Travels.* There was a man, a German astrologer, named Johann Faust, who lived from 1485 to 1540, and about him were woven those weird legends of which Goethe made use. Nor was Goethe the only one who found in his strange career an inspiration; all in all, no fewer than four thousand books were written about him.

When but sixteen years of age, the story goes, Faust, then a theological student at Ingolstadt, became interested in astrology and black magic, and turned to the study of these arts, in which he also instructed his friend Wagner. Having spent a large fortune, he conjured up evil spirits by means of his magic, and made a reckless contract with the devil. According to its terms Faust received Mephistopheles as his servant and embarked upon a riotous career, consulting nothing but his own pleasure, but at the end of twenty-four years the evil spirits carried him off.

The Opera. The music for the world-famous opera based on the Faust legend was composed by Charles F. Gounod (which see). The work has enjoyed unfailing popularity since its first presentation in Paris, in 1859. In this version of the story Faust is an old man, weary of books and learning and disappointed with life. Shown a vision of the beautiful Marguerite, he signs a contract with Mephistopheles, is changed into a young man, and gives himself up to the pleasures of youth and love. In the end, Marguerite dies in prison to the chant of a heavenly choir, as Mephistopheles, carrying out the terms of the contract, drags Faust down with him into the regions below. Other important characters are Dame Martha, companion of Marguerite (contralto); the heroine's brother, Valentine (baritone), who is killed by Faust in a duel; and Siebel, friend of Valentine. The latter rôle is always acted by a woman, as the music for that part is written for a soprano voice.

The popularity of *Faust* is due almost wholly to the exquisite music. Marguerite's spinning-wheel song, *Once There Lived a King in Thule* (Goethe's famous ballad), the stirring *Soldiers' Chorus* of the fourth act, Marguerite's *Jewel Song* and the duet of the lovers, *Forever Thine,* are among the favorite melodies of the opera. The part of Faust has been sung by many noted tenors, among them Jean de Reszke. Madame Melba was one of the most successful Marguerites. M.S.

FAUST, *foust,* or **FUST,** JOHANN (? - 1466), a German citizen of Mainz, who furnished money to produce the first printed book in the world. He was a partner of Gutenberg, inventor of printing. When the latter undertook to produce a copy of the Bible printed with type and was unable to finish it because he lacked the necessary funds, Faust loaned him a large sum of money, taking a mortgage on his business as security. Gutenberg could not repay him, and the partnership was dissolved. Among their printed books were the *Mazarin Bible,* sometimes called the *Forty-*

two-line Bible, from the number of lines of type to a column, and a *Latin and German Bible.* Faust continued the business with his son-in-law, Peter Schöffer, until his death, which occurred in 1466, supposedly from the plague. Several copies of their books still exist. See GUTENBERG, JOHANNES; PRINTING.

FAWKES, *fawks,* GUY (1570-1606), a conspirator who endeavored to avenge the persecution of Roman Catholics in England by blowing up King James I and the Parliament. Gunpowder was hidden beneath the Houses of Parliament, and all was in readiness, when Fawkes was betrayed and captured. November 5 is still celebrated as Guy Fawkes Day. See GUNPOWDER PLOT.

FEAR, a cape in North Carolina, extending from Smith Island into the Atlantic Ocean; it is near the southern extremity of the coastline of the state. Navigation is dangerous around this point, because of the frequent storms; it is this fact which gave rise to its name.

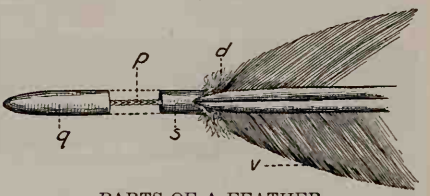
FEASTS. See FESTIVALS.

FEATH'ERS, outgrowths of the skins of all birds, which furnish them the means of flight and provide light, warm, attractive body coverings. They are not only a delight to the eye of man but are of value in the arts and industries.

Four Kinds and Four Parts. In an age long past, the present graceful songster of the air belonged to the same family as the ugly, scale-covered reptile, a kinship which is made apparent by a study of the feathery covering of the bird. With the aid of a microscope one may see the scale-like growths on the skin, from which have pushed forth the wing and tail *quill feathers;* the general covering of *contour feathers;* the soft, plume-like *down feathers,* lying between the later contour feathers, and, finally, the hair-like *pin feathers,* which the housewife singes off in preparing poultry for the table.

Studying just one feather from the point of its growth, one would see first the *quill,* a strong, round, horny, tapering stem, hollow in the lower part, and extending into a pith-filled *shaft.* From each side of the shaft grows a web of fibers called *barbs,* arranged in regular order and forming, together with the shaft, the *vane.* Sometimes the barbs of a vane are edged with *barbules,* which interlock with those on the edges of adjacent barbs. Such a vane is very close and strong.

Feathers do not grow from all parts of the skin, however, but only in definite places called *pterylae;* the bare intervening spaces are covered by the overlapping feathers. Periodically feathers are shed and renewed by a process called molting.



PARTS OF A FEATHER

(*q*) Quill (*p*) Pith
(*s*) Shaft (*d*) Downy portion
(*v*) Vane

Commercial Uses. The chief uses of feathers are for stuffing bedticks, quilts, cushions and upholstery; they are also used for ornamentation. In a former day they were made into pens. For the first four uses named, feathers of ducks and geese are most valuable, especially those of the eider duck. Through efforts of Audubon societies there is a diminishing use of feathers as ornaments, but statistics show that feather goods manufactured in the United States yearly are valued at about $35,000,000, and in Canada at about $400,000.

Prices vary with quality, coloring and extent of supply. The most expensive feathers, used in millinery and women's headdress and by Oriental princes, are those of the bird of paradise.

Feathers from the egret, known as *aigrettes,* are becoming more scarce and are growing increasingly expensive. They are used for military plumes as well as on hats and in the hair of women. Drooping, graceful ostrich plumes, in natural colors or dyed in many shades and tints, are used for headdress, muffs, boas and ornamentation of costumes. Soft, light, fluffy feathers of some of the storks are as widely used as ostrich feathers.

Brilliantly-colored feathers of various other birds, such as humming birds, pheasants, grebes, peacock and turkeys, are used for personal adornment by people of all nations and in all stages of civilization, and even the commonest, plainest feathers are dyed and effectively employed.

Related Subjects. The reader is referred to the following articles in these volumes:

Audubon Society	Molting
Bird	Ostrich
Bird of Paradise	Pheasant
Egret	Poultry

FEBRUARY, the second and the shortest month of the modern calendar year. Its name, no longer significant in any way, used to mean a great deal to the ancient Romans, for it came from a word meaning *to purify;* this was the month in which the people were purified for the religious festivals of the following months. The primrose is the special flower for February, and the amethyst is its gem.

Its History. February was not one of the "pioneer" months—that is, it was not in that earliest calendar year which Romulus drew up. Numa, however, added Februaris, but placed it at the very last of the year, and not for centuries was it transferred to its permanent place after January (see CALENDAR).

> All the rest have thirty-one,
> Excepting February alone,
> Which has but twenty-eight, in fine,
> Till Leap Year gives it twenty-nine.

says an old rhyme; but February has not always been so far short of its sister months in the number of days. Until the time of Julius Caesar it had thirty days, but Caesar took one from it to lengthen out his honor-month, July; and when Augustus named the eighth month after himself, he, too, took from February the extra day needed. Every four years comes leap year (which see), and gives to the month a twenty-ninth day.

Its Character. February is cold and stormy in north temperate regions. Often the very heaviest snowstorms of the year come in this late winter month, though it is likely, too, to have occasional warm, sunny days that point forward to spring. There is an old belief, valueless but interesting, connected with February weather. On the second of the month, *Groundhog Day,* it is said the groundhog pushes his way out of his winter burrow and looks about him. If he can see his shadow he creeps back for another sleep of six weeks, but if the day is cloudy he knows that spring has almost come and there is no more time for dozing.

Special Days. February has an unusual number of days of peculiar interest, most of them birthdays. Lincoln, Washington, Dickens, Lowell and Longfellow—these are but a few of the great men whose birthdays fall within this month; and every one of these had the character and the determination to achieve high ambition which make the story of their lives the most inspiring sort of study.

There is Saint Valentine's Day, on the fourteenth day, named for a Catholic Saint, but given over to that kind of sentiment which must not be taken too seriously. Candlemas Day, which falls on February 2, is a festival of the Roman Catholic Church, during which the candles to be used in services throughout the year are consecrated. (See pages 2146-2147.)

FED'ERAL HALL, an historic building in New York City, the first capitol of the United States, therefore the building in which the First Congress met. The building had been known as the City Hall. It stood at the corner of Broad and Wall Streets; to be more in keeping with the new government it underwent extensive repairs and was rechristened Federal Hall just before Washington's first

FEDERAL HALL

The building which housed the First Congress of the United States, whose most important work was probably the passage of the first ten Amendments to the Constitution. Washington stood on the upper balcony when he took the oath of office as President.

FEBRUARY CALENDAR

Birthdays

3. Albert Sidney Johnston, 1803.
   Joseph E. Johnston, 1807.
   Felix Mendelssohn-Bartholdy, 1809.
   Horace Greeley, 1811.
   Sidney Lanier, 1842.
4. Mark Hopkins, 1802.
5. James Otis, 1725.
   Zebulon M. Pike, 1779.
   Sir Robert Peel, 1788.
   Dwight L. Moody, 1837.
6. Queen Anne, 1665.
   Aaron Burr, 1756.
7. Sir Thomas More, 1478.
   Millard Fillmore, 1800.
   Charles Dickens, 1812.
8. William T. Sherman, 1820.
   Jules Verne, 1828.
9. William Henry Harrison, 1773.
   Samuel J. Tilden, 1814.
   John A. Logan, 1826.
10. Charles Lamb, 1775.
11. Alexander H. Stephens, 1812.
    Thomas A. Edison, 1847.
12. Peter Cooper, 1791.
    Abraham Lincoln, 1809.
    Charles Darwin, 1809.
14. Winfield Scott Hancock, 1824.
15. Galileo, 1564.
    Susan B. Anthony, 1820.
    Elihu Root, 1845.
18. Queen Mary of England, 1516.
19. Copernicus, 1473.
    David Garrick, 1717.
20. William H. Prescott, 1726.
    Joseph Jefferson, 1829.
21. John Henry Newman, 1801.
22. George Washington, 1732.
    James Russell Lowell, 1819.
23. George Frederick Handel, 1685.
24. George William Curtis, 1824.
25. Charles C. Pinckney, 1746.
26. Victor Hugo, 1802.
    W. F. Cody ("Buffalo Bill"), 1845.
27. Henry W. Longfellow, 1807.
28. Raphael, 1483.
    Marquis de Montcalm, 1712.

Events

1. King Carlos of Portugal assassinated, 1908.
2. First Parliament of Great Britain and Ireland met, 1801.
3. Territory of Illinois created, 1809.
4. Last day of hostilities in Revolutionary War, 1783.
5. Victoria Cross instituted, 1856.
6. Reconstruction Act brought forward in Congress, 1867.
8. Mary, Queen of Scots, beheaded, 1587.
   Inhabitants of Schenectady, N. Y., massacred by Indians, 1690.
   Temporal power of the Pope ended, 1849.
9. English gained control of New Amsterdam, 1674.
   John Q. Adams elected President, 1825.
   Jefferson Davis chosen Confederate President, 1861.
   Robert E. Lee took command of forces of Confederacy, 1865.
   Nebraska admitted to the Union, 1867.
10. By Treaty of Paris, France surrendered Canada, 1763.
    Marriage of Queen Victoria and Prince Albert, 1840.
    Upper and Lower Canada reunited, 1840.
    Spanish-American War closed by treaty, 1899.
12. Lady Jane Grey beheaded, 1554.
    Settlement established at Savannah, Ga., 1733.
    Independence of Chile secured by Battle of Chacabuco, 1818.
13. Crown of England offered to William and Mary, 1689.
    Warren Hastings brought to trial, 1788.
    Mutsuhito became Japanese emperor, 1867.
14. Canada became a royal province, 1663.
    Oregon admitted to the Union, 1859.
    Yuan Shih-kai made first President of China, 1912.
15. The *Maine* blown up in Havana harbor, 1898.
16. Surrender of Fort Donelson, 1862.
17. Dual government adopted by Austria-Hungary, 1867.
    Suez Canal first opened to ships, 1867.
18. Inauguration of Jefferson Davis, 1861.
    Germans began submarine blockade of Great Britain, 1915.
20. Congress passed reconstruction bill, 1867.
    Leo XIII became Pope, 1877.
    Revolution began in Cuba, 1895.
21. Washington monument dedicated, 1885.
22. Florida ceded by Spain to the United States, 1819.
25. John Adams appointed first minister of United States to England, 1785.
26. Napoleon escaped from Elba, 1815.
    English Test Acts repealed, 1828.
    Treaty of Versailles signed, 1871.
28. Upper Mississippi River exploration by Hennepin begun, 1680.

FEBRUARY QUOTATIONS

1. The February sunshine steeps your boughs,
   And tints the buds and swells the leaves within. —*Bryant.*

2. I beat the Austrians because they did not know the value of five minutes. —*Napoleon.*

3. By so many roots as the marsh-grass sends in the sod,
   I will heartily lay me ahold on the greatness of God. —*Lanier.*

4. Honour is not won
   Until some honorable deed be done.
   —*Marlowe.*

5. The day is ending,
   The night is descending,
   The marsh is frozen,
   The river dead. —*Longfellow.*

6. Procrastination is the thief of time.
   —*Young.*

7. Oh, a dainty plant is the ivy green,
   That creepeth o'er ruins old!
   Of right choice food are his meals, I ween,
   In his cell so lone and cold.
   —*Dickens.*

8. This above all: to thine own self be true,
   And it must follow, as the night the day,
   Thou canst not then be false to any man. —*Shakespeare.*

9. The little birds twitter and cheep
   To their loves on the leafless larch:
   But seven foot deep the snow-wreaths sleep,
   And the year hath not worn to March.
   —*Symonds.*

10. "Presents," I often say, "endear Absents." —*Lamb.*

11. Honour and shame from no condition rise;
    Act well your part, there all the honour lies. —*Pope.*

12. Let us have faith that right makes right and in that faith let us dare to do our duty as we understand it. —*Lincoln.*

13. Around, above the world of snow
    The light-heeled breezes breathe and blow;
    Now here, now there, they whirl the flakes
    And whistle through the sun-dried brakes,
    Then growing faint, in silence fall
    Against the keyhole in the hall.
    —*Bensel.*

14. Hail to thy returning festival, old Bishop Valentine! * * Like unto thee, assuredly, there is no other mitred father in the calendar.
    —*Lamb.*

15. Soul sincere,
    In action faithful, and in honor clear;
    Who broke no promise, serv'd no private end,
    Who gained no title, and who lost no friend. —*Pope.*

16. A little too late is much too late.
    —*German Proverb.*

17. Better to die ten thousand deaths,
    Than wound my honour.
    —*Anonymous.*

18. The speckled sky is dim with snow,
    The light flakes falter and fall slow;
    Athwart the hill-top, rapt and pale,
    Silently drops a silvery veil;
    And all the valley is shut in
    By flickering curtains, gray and thin.
    —*Trowbridge.*

19. Remember that time is money.
    —*Franklin.*

20. Consider your honor of more weight than an oath. —*Solon.*

21. It is pleasant to think, just under the snow,
    That stretches so bleak and blank and cold,
    Are beauty and warmth that we cannot know,
    Green fields and leaves, and blossoms of gold. —*Hempstead.*

22. Labour to keep alive in your breast that little spark of celestial fire—conscience. —*Washington.*

23. Early to bed and early to rise
    Makes a man healthy, wealthy and wise. —*Franklin.*

24. Strict punctuality is perhaps the cheapest virtue which can give force to an otherwise insignificant character. —*Bayes.*

25. Millions for defense, but not one cent for tribute. —*Pinckney.*

26. Each man, unknowing, great,
    Should frame life so that at some future hour
    Fact and his dreamings meet.
    —*Hugo.*

27. Sail on, O Union, strong and great!
    Humanity with all its fears,
    With all the hopes of future years,
    Is hanging breathless on thy fate.
    —*Longfellow.*

28. Beneath the ceaseless-beating rain
    Earth's snowy shroud fast disappears,
    As sorrow pressing on the brain
    Fades in a flood of tears. —*Dazey.*

For February Study

Evangeline
Frost
Gettysburg Oration
Grackle
Groundhog
Ice
Mardi Gras
Meadow lark
Night
Phonograph
Pine
Rip Van Winkle
Snow
Star
Valentine's Day

inauguration. On April 30, 1789, six days after Washington's triumphal arrival in New York, that ceremony took place from its balcony, the oath of office being administered by Robert R. Livingston, chancellor of the state of New York. The sub-treasury building, which now stands on its site, was erected in 1836.

FED'ERALIST, THE. When the new Constitution of the United States was presented to the states for ratification, there was bitter opposition to it from various sources, for its design was not understood by a large number of people. In order to meet all objections that were made, and to make its meaning and purpose clear to everyone, Alexander Hamilton, James Madison and John Jay wrote a series of essays covering all points in controversy; these were eventually published in book form under the title *The Federalist*. There were eighty-five of these essays, all but eight of which were published in the *Independent Journal*, a semi-weekly newspaper of New York, between October 27, 1787, and April 2, 1788, under the signature "Publius." Hamilton wrote more than fifty of the essays, Madison about one-third, and Jay the remainder.

The importance of *The Federalist* is aptly summarized in the words of the historian Fiske, who said: "*The Federalist* did more than anything else at the time save the influence of Washington alone to secure the adoption of the new Constitution, and it still occupies the highest place as an exposition of the principles of our Federal government."

FEDERALIST PARTY, a political organization in 1787 and the years immediately following, which advocated the adoption of the Constitution by the thirteen states of the new American Union. There was much opposition to the Constitution in the form in which it came from the Convention; the Federal party name was in harmony with the object of the organization—the success of the campaign in behalf of the Constitution; the Federalists favored the strong central government the Constitution provided, while the opposing forces, appropriately called the Anti-Federalist party, believed in a loose national confederation, and advocated the supremacy of the states. The Federalists won, and until 1800 they controlled the new nation, under Presidents Washington and Adams. In that year they suffered defeat, for the original Anti-Federalists, then called Democratic-Republicans, elected Thomas Jefferson to the Presidency. The Federalists had changed their name to National Republicans, but grew weaker year by year, and the organization practically disappeared, to be revived later in the Whig and Republican parties. See POLITICAL PARTIES IN THE UNITED STATES.

FEDERAL RESERVE BOARD AND BANKS. See BANKS AND BANKING.

FEDERAL TRADE COMMISSION, an investigating and administrative body, created by Act of the Congress of the United States in 1914, for the purpose of supervising the activities of persons and corporations engaged in interstate trade. There are five members of the commission, appointed by the President with the consent of the Senate, for seven-year terms, at an annual salary of $10,000 each. Not more than three of the members may be of one political party.

In a general way the functions of the Trade Commission with respect to interstate trade correspond to those of the Interstate Commerce Commission (see INTERSTATE COMMERCE ACT) with respect to common carriers. The law creating the Trade Commission declared that unfair methods of competition are unlawful, but it left to the Commission the right to say what methods are unfair. Whenever it is convinced that cases of unfair competition exist, it may order the persons or firms involved to submit the facts to a hearing, or it may order a hearing at the request of the President, of either house of Congress, or of the Attorney-General. The Commission has complete power to investigate all interstate corporations except banks and common carriers; it may demand access to all books and records, may compel witnesses to testify and may require annual or special reports. Any orders issued by the Commission may be enforced through the United States Circuit Court of Appeals, which also has exclusive jurisdiction in appeals involving points of law. On points of fact the Commission's decision is final, unless it can be proved to be contrary to the evidence presented.

FED'ERATED MA'LAY STATES. The southern third of the Malay Peninsula, at the southeast corner of Asia, is occupied by a group of four Mohammedan states which are under the protection of Great Britain. The governor of the adjoining Straits Settlements is High Commissioner of the federation, and each of the four governments—Perak, Selangor, Negri Sembilan and Pahang—has a native sultan, but is really governed by a state council

in which the sultan shares power with Malay chiefs, Chinese merchants and a British *resident*. This form of government has been gradually established since 1874.

Of the million people who inhabit the 27,500 square miles of the Federated Malay States, only two-fifths are Malays, a slightly larger number being Chinese and nearly all the rest British Indians. The Chinese and Indians have been drawn to the country by its marvelous natural wealth, to develop which the government has constructed more than 800 miles of railway and over 2,000 miles of cart roads. The states are the source of nearly half the world's tin and are becoming one of the most important centers of rubber culture.

FEDERATION OF LABOR, American. See Labor Organizations.

FEEBLE-MINDED, Education of the, a term which embraces all the activities involved in training, in school homes and asylums, those persons who are mentally defective. The purpose is to make them less a burden to themselves and others. There are three classes of mental defectives, not including the insane (see Insanity). The most helpless of these classes are idiots, who have no power of attention and self-control; the next group includes the simple idiots, whose attention is feeble and difficult, and who do not develop beyond the mental age of seven; the third, the imbeciles, are the most teachable. However, since they have weak will power and initiative, they need to be directed even in their play. This latter group possess the minds of children from seven to twelve, and never develop beyond that degree of mentality. For these reasons the schools must be homes for the continuous residence of all inmates.

Kindergarten games and exercises, such as stringing beads and spools, block-building, etc., are included in the training received by the majority of feeble-minded pupils. Reading, writing and number work are within the capacity of only a few. Gymnastics and marching to music are provided to develop bodily control. For the most part the education is motor and practical. The boys are taught mat-making, shoe-mending, weaving, tinsmithing, carpentering, gardening and farming, and the girls are instructed in the care of the home, in cooking and in sewing. Much of the work in these homes is done by the inmates. Farm colonies are operated in several states with successful results. In Canada each province cares for its own mental defectives.

Recent data collected in a study of 10,000 school children, in the states of California, New Jersey and Philadelphia, showed three per cent to be in some degree feeble-minded. More than eighty per cent of the truants and one-half of the paupers and degenerates are mentally defective. About sixty-six per cent of the cases of feeble-mindedness and idiocy are from alcoholic families.

FEEL'ING. We know, we feel, we will; or, to express the same thoughts in other words, we think, we enjoy or suffer, we act. All mental activity consists of knowing, feeling, willing. Feeling accompanies all mental acts and constitutes the personal element in them. We can understand feeling only through experience. Unless one has felt pleasure and pain, joy and sorrow, all the literature ever written upon these subjects could not make him understand them. Because feeling is such a strong personal element in mental activity it is difficult to define, and the word is used in popular language to express a great variety of meaning.

We say we feel hungry, or thirsty, or fatigued; we also say we have a feeling of ill-health, or of drowsiness. In all these cases the word *feeling* is used to express the total consciousness of a complexity of organic sensations. As these organic sensations are frequently accompanied by pleasure or pain, the popular use of the term is to a certain extent correct. We may define feeling as the subjective side of any modification whatever of consciousness, for feeling, with its tone of pleasure or pain, enters into every operation of the conscious mind.

Besides the feelings, described above, that accompany general physical conditions, there are feelings which are occasioned by organs of special sense, such as the pleasure we derive when seeing a pretty landscape, a glorious sunset, a beautiful picture, or when hearing a sweet melody. Finally, there are feelings which are occasioned by our knowledge or our ideas, and are known as *intellectual*, or *ideal* feelings. These higher feelings are known as *emotions*.

Quality of Feeling. Feelings are either pleasurable or painful. These qualities are intimately associated with the condition of the nervous system. Pleasure results from working off a surplus of nervous force and energy; this is the reason why children enjoy running and other muscular exercises. The fact holds good also for animals. An animal feels pleas-

ure when it is able to exercise the special kind of activity for which it instinctively craves. As an instance, everybody has noticed how a kitten likes to play with a rolling ball. The instinct of a kitten is to stalk prey and seize it by a sudden leap. The rolling ball sets this instinctive organization in motion, and the kitten derives pleasure from exercising it.

Characteristics of the Feelings. We have seen that feelings are accompanied by pleasure or pain. This is known as the *tone* of the feeling. Besides tone, feelings, including the emotions, are characterized by strength, rhythm and content. *Strength* refers to the intensity of the feeling. By *rhythm* is meant the length and the form of feelings. A feeling, for instance, like anger, rises gradually and then subsides, following a rhythmical motion comparable to the waves of the sea. By *content* is meant the mental state that occasioned the feeling. The content may be very simple, as when we view a beautiful landscape, or it may be complex, as when we are stirred by love of country.

Related Subjects. The reader is referred to the following articles in these volumes:

Interest Will
Psychology

FELDSPAR, *feld'spahr.* If we examine a piece of granite, we notice one substance which gives the rock its prevailing color; it has a pearly luster, and may vary in color from white to pink, red or green. This substance is feldspar; next to quartz and limestone it is the most important rock-forming mineral. Feldspar is a compound of silica and aluminum, combined with potash, soda or lime. So we have potash feldspar, soda feldspar and lime feldspar. Potash feldspar is the most abundant and is generally known as common feldspar—the kind seen in granite. Another name for it is *orthoclase,* a Greek word meaning *splitting at right angles,* and used because the ends of crystals of feldspar form right angles with the sides, which are five in number, so that a perfect crystal of feldspar is a five-sided prism. There are many varieties of feldspar; one of the purest forms kaolin (which see). Another variety is known as *moonstone,* because its surface has the appearance of reflected moonlight. *Labradorite* contains beautiful blue crystals, *microcline* is light green, *anorthite* is pink, and a peculiar white variety is known as *albite.* See GRANITE; CLEAVAGE.

FE'LIX, ANTONIUS, a Roman procurator, or governor, of Judea (A. D. 52-60), who rose to power from slavery and governed with excessive severity. His rule was marked by constant disturbance and revolt. Unfavorable reference to him is made in history by Tacitus and in the New Testament (*Acts* XXIII). The Apostle Paul was sent to be judged before him and was held in custody for two years.

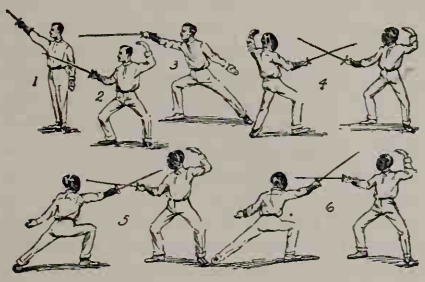
FELLOWSHIP, *fel'o ship,* a sum of money, the income of which is bestowed upon a graduate of a college or university for marked proficiency, to aid him in pursuing further studies. The average amount given to a student is $500; many fellowships are for less amounts, while others are for more, such as the Johnston appointment at Johns Hopkins University, which is $1,500. A fellowship is usually bestowed without regard to the college of which the student is a graduate. However, the holder is expected to do graduate work in the department to which the fellowship is attached, and generally this work must be done at the institution which grants it, or at some other particularly specified.

At the University of Illinois are ten $500 fellowships in experimental engineering, while at Harvard there are thirty teaching fellowships. Most of the money which forms the foundation, or fellowship, comes from personal gifts, bequests, or memorial gifts, while the remainder is appropriated from general university funds. Fellowships in the United States are usually for one year, though the student may be reëlected; but in England the ordinary holding lasts six or seven years, while many fellowships are held a lifetime. In the Sorbonne at Paris the fellowship has become merely an honorary distinction with no money attachment, while in the newer English universities it is rarely worth more than $150, and is held for from one to three years.

FELONY, *fel'o ni,* any offense of a nature so serious as to be punishable by death or imprisonment. The crimes classed as felonies are homicide, or the killing of one person by another, theft, robbery, burglary and like offences. Under constitutional law it is not possible to extend any penalty beyond the loss of life or liberty of the guilty individual, and most states and provinces now define the penalties by statute. A violation of law of less serious nature than felony is punishable by a fine, or brief jail sentence, and is known as a *misdemeanor* (which see).

FELT, from the Dutch *vilt,* is an unwoven material made from wool, hair and fur, matted together with the aid of moisture and heat by a process of rolling, beating and pressure. It is said to be of Asiatic origin, dating from remote times, and the best and most durable felts are still made in Persia and neighboring countries. It was introduced into Europe at the period of the Crusades. In ancient times it was used for tents, hats, coats and carpets. A higher grade of felt has been obtained since the invention of the microscope, which made possible the minute examination of the wool fiber structure, and resulted in more scientific manufacturing methods. Various grades of the material are in use for a vast number of purposes, including millinery, men's hats, carpets, rugs, lining of rubber shoes, gloves, trimmings, etc., and, on account of its heat-resisting qualities, as a covering for steam pipes, boilers, cylinders, etc. It is, perhaps, of the greatest importance as headwear.

FENC'ING, the use of a sword or a foil, or of a weapon having either a point or an edge, for the purpose of attack or self-defense. This use of the foils prevailed for centuries, but within the past hundred years fencing has



POSITIONS IN FENCING

(1) First position
(2) On guard
(3) The lunge
(4) Engagement in tierce
(5) Parry in quarte
(6) Parry in septime

been merely a sport wherein is practiced the art of self-defense. The art is said to have originated in Italy in the sixteenth century, and quickly became popular in Spain and France, where it was one of the principal pastimes of the nobility. It was the usual medium for dueling before that practice began to be regarded with disfavor in the early part of the nineteenth century. Its development was aided by the invention of gunpowder, which rendered armor useless.

Fencing is now one of the favorite sports of modern times, and is played only with light foils or small flexible swords tipped with rubber buttons. Its practice cultivates a graceful carriage, and promotes agility and muscular control. Bayonet fencing is a favorite form of exercise in armies. A bayonet is attached to the end of a rifle and is used in the same general manner as the small sword.

Some of the terms peculiar to fencing may be defined as follows: *Feint,* a movement to mislead an opponent; *parry,* a defense against a thrust; *riposte,* a thrust made after a parry; *appel,* a smart stamp of the right foot upon the ground in a retreat or a feint; *prime* and *quarte* refer to the part of the body to the left of the blade and above the hand; *septime* and *quinte,* to the left but below the hand; *tierce* and *sixte,* to the right above the hand; *octave* and *second,* to the right below the hand.

FÉNELON, *fa n' lawN',* François de Salignac (1651-1715), a distinguished French author and churchman, born in Périgord and educated at Plessis College, Paris, and at the Seminary of Saint Sulpice, where he was ordained in 1675. In 1678 he was placed at the head of an institution designed to harbor and convert to Roman Catholicism the young daughters of the Huguenots who remained in France. In 1689 he became the tutor of the grandsons of Louis XIV, and in 1695 was appointed archbishop of Cambrai. His most celebrated work is *The Adventures of Telemachus,* a form of historical romance dealing with the wanderings of the son of Ulysses. His other works, in the domain of philosophy, include *The Maxims of the Saints, The Education of Girls* and *The Temporal Power of the Medieval Popes.*

FENIANS, *fe'ni anz,* a political association of Irish and Irish-Americans, said by some to have been founded in New York and by others to have originated in Paris. Its object was to secure the independence of Ireland and its establishment as a republic. The movement was organized in 1861; it spread through the United States and Ireland and among the Irish inhabitants of Great Britain, resulting in revolt in Ireland and an attempted invasion of Canada from the United States. *Fenian* was the official title of the American branch only, but in the public mind it covered the entire movement. After 1872 the organization continued as a secret society for a number of years. Present-day efforts to improve the condition of Ireland are related under the title Home Rule.

FENNEL, *fen'el,* an herb of the parsley family, the leaves of which are very fragrant

and are often used, especially in Europe, to season sauces. The seeds also have a pleasing odor and warm taste, and are used to give a pleasant flavor to medicine. Although found wild in the United States and Canada, the fennel is popular in Europe as a garden plant. This herb, with its small, yellow flowers and finely-divided leaves, appears frequently in literature, in the early days, having been an emblem of strength and valor.

FER'DINAND I (1503-1564), and **FERDINAND II** (1578-1637), two Holy Roman emperors (see HOLY ROMAN EMPIRE). Ferdinand I was the son of Charles V of Germany, whom he succeeded as emperor in 1556. Previously, in 1526, he had been crowned king of Bohemia; his claim to the throne of Hungary was assured only after several years of warfare (see AUSTRIA-HUNGARY). His rule as emperor was mild and just, and was notable for his reform of the currency in Germany.

Ferdinand II, grandson of Ferdinand I, succeeded his uncle Matthias as emperor in 1619. Two years before this he was chosen king of Bohemia, and in 1618, king of Hungary. As he was Roman Catholic in his sympathies, his Protestant subjects in Bohemia rose in revolt against him, bringing on the terrible religious struggle known as the Thirty Years' War (which see). With the increase of power resulting from his election to the office of emperor, he was able without great difficulty to crush the Bohemian insurrection. His reign was almost wholly occupied with the Thirty Years' War, the completion of which he did not live to see.

FERDINAND II (1810-1859), king of Naples and Sicily, known as the Two Sicilies. He was nicknamed "King Bomba," and was the son of Francis I. In early life he was popular with the idlers of Naples. In 1830, when he succeeded his father, he promised his subjects to "give his most anxious attention to the impartial administration of justice," but he made only slight concessions, for the burden of taxation was lightened but little and he quickly established a despotism worse than that of his father and gave no heed to the welfare of his people.

In 1832 he married the daughter of Victor Emmanuel and four years after her death married Maria Theresa of Austria. His nickname of "Bomba" arose from his bombardment of Palermo from the forts commanding it. In 1848 a revolution against him spread over his kingdom; he granted a constitution, but a dispute arose as to the nature of the oath for his deputies and he dissolved Parliament in March, 1849. Despotism was again established, and he died just after France and Piedmont, a province in Italy, had declared war against Austria; this struggle resulted in the downfall of his kingdom.

FERDINAND IV (1751-1825), king of Naples, known also as Ferdinand I of the Two Sicilies. His reign was more of a burden than of a blessing to his country. When his father became king of Spain in 1759 as Charles III Ferdinand succeeded him as ruler of Naples. A regency was established, and the young king's education was purposely neglected in order that he might more completely be dominated. In 1768 he married the masterful Maria Carolina, daughter of the empress Maria Theresa, and she set about making Naples a great power. When the French monarchy fell during the Revolution (see FRENCH REVOLUTION), the king and queen joined the union against France and ordered wholesale executions and arrests, which continued until the king was forced to agree to a treaty. When war broke out between Austria and France in 1805 he signed a treaty with France, but soon after formed an alliance with Austria. After Napoleon made his brother Joseph king over Naples, the queen was exiled to Austria, where she died. Ferdinand returned to Naples after the fall of Napoleon, but repudiated his oath after he had twice sworn to maintain the new constitution, thus provoking the enmity of the party which had planned to reëstablish him in power.

FERDINAND V (1452-1516), king of Aragon, who with his wife Isabella deserves some credit in connection with the discovery of America, was born in Sos, Aragon, Spain. He was the son of John II of Aragon, and through his marriage in 1469 to his cousin Isabella, queen of Castile, heiress of her brother, Henry IV, the two kingdoms were united. After a ten years' war it was possible to expel the Moors from Granada and end their rule in Europe. For this act the Pope gave him the title of *The Catholic*. Ferdinand and Isabella played a leading part in Europe; the king, supreme in Aragon, aimed at great political power; the queen continued at the head of the government of her own kingdom.

The discovery of America was the most momentous event of their reign. Ferdinand was indifferent when Columbus first pleaded his cause, but Isabella declared she would under-

take to finance the project for Castile; she therefore furnished three little ships and offered to pledge her jewels, if necessary. Columbus' discoveries made them sovereigns of a new land, and eventually made Spain the first power in the world. After the death of Isabella in 1504 Ferdinand added to his kingdom both Naples and Navarre.

FERMENTATION, *fer men ta'shun,* a chemical change which takes place in animal or vegetable matter through the action of certain organisms called *ferments.* One of the familiar examples of fermentation is the action of yeast in bread dough. Yeast, which is a form of plant life and one of the most important ferments, changes the starch in the flour to sugar, and then decomposes the sugar into carbon dioxide and alcohol. This process is shown in the bubbles of gas which honeycomb a mass of dough that has been set to "rise." The souring of milk, the change of apple juice to hard cider and of sweetened water to vinegar, the ripening of cheese, the decaying of fruit and the putrefying of meat, are other illustrations of fermentation.

Fermentation also plays an important part in the digestion of food. Gastric juice contains two ferments, *rennin* and *pepsin.* The former acts by curdling milk, and the latter by softening the albumin of food so that it will dissolve in water and be absorbed into the blood. When harmful germs of fermentation are taken into the body the acid of the gastric juice destroys them, but if, for some reason, the acid is too weak to do its work, these germs, by the process of fermentation, turn the food sour, and the result is an attack of indigestion.

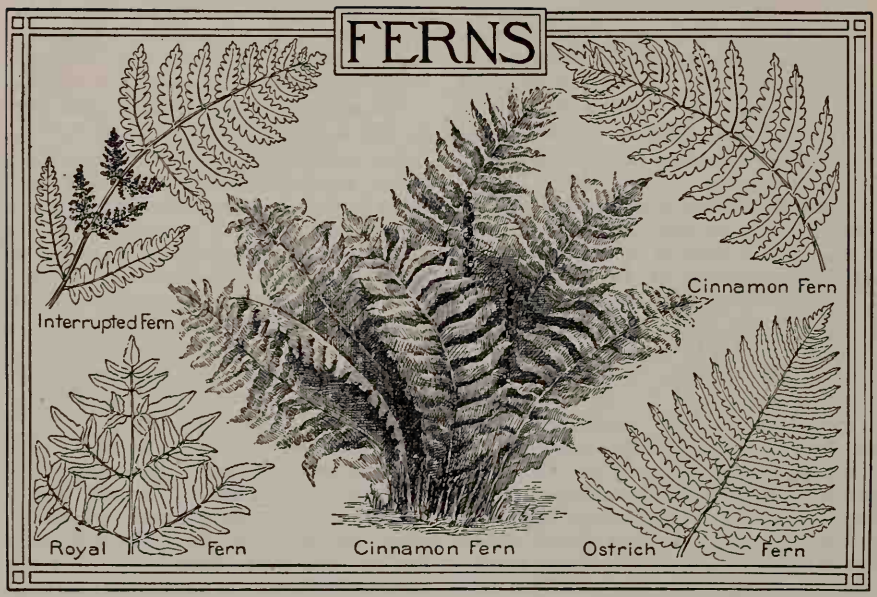
Fermentation is one of nature's wonderful schemes of economy. Plants obtain all their food from the ground and air. When a plant dies it is due to numerous little germs which begin the process of decay; the result is that the plant returns to the ground and air to be used again in the growth of other plants.

The subject of fermentation directly concerns the housewife who is confronted with the task of keeping the food that comes into the home sweet and wholesome; that is, free from harmful fermenting agents. Some of the most familiar devices for preserving household foodstuffs are quite simple. Foods are placed in various containers that they may be protected from dirt, flies and other forms of contamination; bread is always covered so it will not become moldy, etc. Before the ice box became so common the old-fashioned well was utilized as a storage house, milk, butter and other perishable foods being suspended in it on account of its coolness. Now the household refrigerator is everywhere used for keeping foods sweet in the warm season. The ice box itself may become a source of contamination, however, if not kept scrupulously clean. A neglected corner swarming with germs may easily cause milk to turn sour or butter to spoil.

Fruits, vegetables and meats that are canned, pickled or preserved are insured against fermentation by being sterilized and sealed in air-tight, sterilized jars or containers. Certain standard preservatives are in common use in household canning; that is, spice and vinegar for fruits, salt for vegetables, salt, spice and vinegar for pickled goods, and salt and spice for meats. Another device for preserving foods is immersion in oil or fat. This is illustrated when the housewife pours a spoonful of olive oil on top of a jar of pickles or a bottle of olives. In the commercial world the preservation of foods has reached a high degree of efficiency; this is told in the articles Cold Storage; Food Products, Preservation of; Meat and Meat Packing. J.F.S.

FERMENTED LIQUORS, *fer ment' ed lik' erz,* a term that includes alcoholic beverages obtained by fermentation, as distinguished from spirituous liquors, which are the result of distillation. The sugar in the juice of fruits is turned to alcohol by fermentation. Grapes so treated furnish wine; ale and beer are made by the fermentation of an infusion of starchy grains which have been previously malted, the starch being turned into dextrin in the process. Cider is made from the fermented juice of apples; mead, the favorite drink of the hardy Norsemen of old, is made from honey. The natives of South Africa make a kind of beer called *twala* from fermented kafir corn. Indians of South America make a liquor named *chica* from corn, and the Kirghiz, inhabiting the steppes of Central Asia, drink *kumiss* made of fermented mares' milk. See Alcoholic Drinks; Distillation; Fermentation.

FERNIE, *fer' ni,* the county town and the provincial police headquarters for East Kootenay district, British Columbia, noted for its immense coal-mining industry, which employs about 1,500 men and has an average annual output of 1,500,000 tons. It is situated near the Elk River, in the extreme southeastern corner of the province, fifty miles west of the



Alberta boundary line and twenty miles north of the Montana state line. The city is served by the Crow's Nest branch of the Canadian Pacific and also by the Great Northern and the Morrissey, Fernie & Michel railways. The place was settled in 1898 and was incorporated as a city in 1904. It was almost completely destroyed by fire in 1908. In 1911 the population was 3,146; in 1916 it was estimated at 3,500, English, Irish, Welsh, Italians and Slavs predominating in the foreign element.

Fernie is located in an agricultural district well adapted to the growing of fruits and vegetables. The coke industry is represented by 500 bee-hive ovens. Other industries of importance are saw mills, machine shops, railway-car shops, foundries, breweries and factories for making fruit boxes, furniture and building material. Noteworthy public buildings are the $100,000 provincial government building, a $100,000 customs office and post office, and a courthouse.

FERNS, *fernz*, a large and important group of flowerless plants, whose delicate and beautiful foliage adds to the attractiveness of the woodlands, and whose habits of growth and reproduction are most interesting. There are about 4,000 species, found both in the temperate regions and in the tropics, and ranging from minute forms whose delicate, filmy leaves resemble moss, to the great treelike ferns of South America and the Pacific Islands, which rise to heights of forty feet or more.

In all except the tree ferns, the parts of the plants that are seen are the leaves only, for the stems and roots are underground. Upon the under surfaces of the leaves, or *fronds*, are found round, brownish spore cases, which contain countless minute bodies known as *spores*. When these become ripe, the cases burst open, and the spores, falling to the ground, sprout and produce a tiny, heart-shaped leaf, which is entirely different from the parent fern. Upon this plant are produced the organs from which, in time, a new fern will spring. This method of reproducing is called by botanists *alternation of generations*.

Some ferns grow on the ground, others live in the water, and some attach themselves to other objects. The latter, known as *climbing ferns*, lack the strength to hold themselves up, and so twine about other objects for support. Among familiar varieties of ferns are the asparagus fern, bearing leaves like tiny spines; the brake (which see); the beautiful dicksonia, lady and New York ferns, with long, plume-like fronds; and the delicate maidenhair (which see).

Fern beds make a delightful nook in a school garden. These plants are hardy and will grow from year to year with little care, if planted on the shady side of the schoolhouse. The

children can add to the beauty of the spot by arranging about the bed a few moss-covered rocks from the woodlands. Ferns afford excellent material for drawing and language lessons, and the study of their growth and habits can be made very interesting.

Geologists say that a vast number of centuries ago, in the era known as the Carboniferous Period (which see), many portions of the earth's surface were covered with a dense growth of ferns. These plants, together with others of their type, produced the vegetable matter from which the great coal deposits of the earth have been formed (see GEOLOGY).

FERRERO, *fer ra'ro,* GUGLIELMO (1872-), a present-day Italian historian whose best work, *Greatness and Decline of Rome,* is declared more ambitious than scholarly. In it, however, he shows wide knowledge of economics and psychology. He was born near Naples, the son of a railway engineer, and after studying law he wrote the *Female Offender,* assisted by Lombroso, whose daughter he married. For several years he was conspicuous for his political writings, and these led to lectureships in Milan on militarism. During the year 1906 he lectured at the College de France and two years later, after traveling in South America, he visited the United States and Canada, delivering a series of historical lectures. In 1913 he wrote the historical work, *Between Two Worlds,* and a year later *Ancient Rome and Modern America.*

FERRET, *fer'et,* a yellowish-white, pink-eyed animal, about fourteen inches long, domesticated in America and Europe and kept to kill mice and rats, and to hunt rabbits. It is a native of Africa, and is related to the

THE FERRET

weasels. It looks like a polecat, but it cannot bear cold and cannot live in cool climates except in houses. Having very slender bodies, ferrets can easily enter burrows, and, when muzzled, are used to drive animals from their holes. They seldom devour the animals they catch, but kill them and suck their blood. They must be carefully watched or they will harm infants and kill poultry.

In the Western United States the black-footed ferret is found. It is pale brown, with black feet, and has a black-tipped tail and a black bar across the face.

As a verb, the word *ferret* means to get information slyly or skilfully.

FER'RIS WHEEL, a type of amusement device and a popular feature at exposition grounds. The largest of its kind and the first to be erected, was named after its inventor, G. W. G. Ferris of Pittsburgh, and was built at the Columbian Exposition, or World's Fair, in Chicago in 1893. This wheel was 250 feet in diameter, and carried thirty-six cars, each car holding forty passengers. It weighed 1,100 tons, and cost $300,000. At the close of the Chicago exhibition it was taken apart, rebuilt and operated for a time at North Clark Street and Wrightwood Avenue, Chicago, and later it was set up in Saint Louis. Finally, its size making it too expensive to move from place to place, it was dismantled and sold.

For a number of years small "Ferris wheels," from twenty to fifty feet in diameter, maintained their popularity on the fame of Mr. Ferris' achievement.

FERRY, *fer'i,* a broad, usually flat-bottomed, boat used to carry people, vehicles and freight across rivers and small lakes. The most primitive, used only on small streams, is a flat barge, upon which a horse and carriage can be driven and be carried to the opposite shore. Such a barge is propelled by a chain or rope cable stretched from one side of the river to the other. Small boats used simply to carry passengers are rowed with oars or poles. On large rivers and lakes where travel is extensive, launches and steam vessels, built with both ends alike so that they can go either way without turning, have taken the place of simpler boats. Passenger ferries in New York carry many thousands of people daily back and forth between Manhattan Island and Jersey City and Hoboken, and ferries of like nature ply between San Francisco and Oakland. Railway ferries are now made large enough to carry entire trains across such bodies of water as the Strait of Mackinac and the Detroit and Columbia rivers; there are two such ferries across Lake Michigan, from Milwaukee to Grand Haven and from Escanaba to Frankfort.

FERTILIZATION OF PLANTS. See CROSS FERTILIZATION; POLLEN AND POLLINATION; BREEDING; BURBANK, LUTHER.

FERTILIZER, *fer'ti ly zer,* any substance that will increase crop yields. Plants require certain foods, and in order to get the best possible returns from the land it is necessary that the ground be supplied with the requisite food to convey to the growing plants. As a general rule, it may be taken for granted that soil that has not been called upon to produce crops needs little or no fertilizer when first cultivated. When land has been long cultivated the properties necessary to promote growth are largely taken out of it, and the land needs fertilizers to restore the proper balance of properties. It is always well to bear in mind that different crops exhaust different food elements in the soil, and that the starvation of land due to constant reproduction of one kind of crop can be prevented by a change of crop, commonly referred to as *rotation of crops,* as well as by an artificial supply of fertilizer. In dealing with fertilizers here it is only intended to consider commercial fertilizers, as distinct from natural manures, which are dealt with elsewhere in these volumes.

Requirements of Plants. Plant life requires ten essential food substances; if these elements are not all present in proper proportions naturally, which is very seldom the case, they must be supplied. These substances are oxygen, hydrogen, nitrogen, carbon, sulphur, phosphorus, potassium, calcium, magnesium and iron. Iron, magnesium and sulphur are generally present in the soil, and it is only in exceptional cases that they have to be supplied. Hydrogen and oxygen are supplied in water. Carbon is received from carbon dioxide in the air. The four almost universally needed plant food substances are calcium, nitrogen, phosphorus and potassium.

The first step of the farmer towards finding out what his soil needs should be to have a sample or samples from different parts of his farm analyzed at the agricultural college of his state or province. This analysis, conducted by experts, will help him in selecting the food substances he must use. If his soil is found to be wanting in calcium, or lime, it can be added to the soil in the form of ground limestone, burned lime such as is used for plastering, hydrated lime, air-slacked lime or wood ashes, which usually contain about one-third lime and some phosphorus and potassium. The amount of lime or any other fertilizer or mixture of fertilizers to be added per acre of ground cannot be definitely stated until an analysis of the soil has been taken, or experimental crops raised, and even then will vary according to the seed to be planted.

Nitrogen is best added to the soil in farm manures, but the most generally used nitrogenous fertilizer is nitrate of soda. This salt is mined in Chile, and is shipped all over the world; it usually costs from $50 to $60 per ton, and contains about fifteen per cent of nitrogen. A soil that is well supplied with lime and decaying organic matter may gain in nitrogen, which is also indirectly received from the air, while the plowing in of clover and alfalfa greatly increases the supply of nitrogen. Another source of the necessary nitrogen is ammonium sulphate, a by-product from the manufacture of coke, which is similar to ammonia combined with sulphuric acid, containing about twenty per cent of nitrogen. Bone meal and dried blood are also used as fertilizers, but they are valuable as feed for hogs and costly as fertilizers.

Soils that are deficient in phosphorus are generally those that are lacking in lime. The phosphorus for fertilizers is mostly mined in the form of phosphate rock in North Carolina, South Carolina, Tennessee and Florida. It is ground to a fine powder and then used as a fertilizer. It usually contains about twenty-five or thirty per cent of phosphoric acid. Most of the phosphorus fertilizer used, however, is obtained by treating the phosphate rock with sulphuric acid, which, although making it more costly, makes it more readily soluble. The phosphate rock derives its phosphorus from the bones of marine animals; in fact, nearly all phosphorus comes from the bones of animals. When bone meal is used as a fertilizer the phosphorus is directly given to the soil.

The potash mines of Germany are the chief sources of the potassium required as plant food. During the War of the Nations, beginning in 1914, this supply was cut off, entailing a scarcity of the product. Kainit, a natural salt mined in large quantities near Stassfurt, Germany, is shipped just as it is when mined and contains about twelve per cent of potash. When treated with acid, however, it usually contains fifty per cent of potash.

Mixed fertilizers as commonly sold contain nitrogen, phosphorus and potassium. When a large quantity of fertilizer is needed it is more economical and satisfactory for the farmer to buy the materials separately and mix them himself. He can thus see exactly what he is using and that the food elements are present

in the proper proportions to meet the requirement of his ground, as it is granted by scientific investigators that different soils and crops require alterations in the proportions in which the composing substances of the fertilizer are mixed. It is also generally conceded that organic fertilizers are preferable to mineral fertilizers, and that methods of intensive farming and rotation of crops preserve the fertility of the soil and increase crop yields, rendering the use of mineral fertilizers almost unnecessary. It should be clearly understood that the use of commercial fertilizers must be absolutely guided by knowledge of the nature of the soil and the crop to be grown, and that the quantities must vary in different localities and climates.

In reasonably good loamy soils phosphoric acid fertilizer for corn will be found more necessary than nitrogen, while in sandy soils nitrogen and potash are more important than phosphorus. The hit-or-miss principle of fertilization, the addition of a fixed quantity of mixed fertilizer to the soil without careful consideration of proportion of the ingredients, should be condemned. Any addition should be the result of intelligent observation of the requirements of the land, either by chemical analysis of the soil or by recorded experiments.

Lasting Effects. The time during which the fertilizer added to the soil will continue effective must depend on the crop that is grown. The various food elements are not absorbed in equal quantities by the growing plants, but the bulletins issued by government agricultural departments will tell the farmers just what elements are exhausted by certain crops and guide him in refertilization. For instance, it is estimated that 100 bushels of corn during growth remove from the soil 148 pounds of nitrogen, twenty-three pounds of phosphorus and seventy-one pounds of potassium. This must be returned to the soil, and to do it the fertilizer must be mixed in the proper proportions. It will be seen that nitrogen will prove the most quickly-exhausted plant food element in the soil. Those lands that are treated with natural manures will more quickly and more naturally receive a quick supply of nitrogen. Nature's way of returning nitrogen to the soil is through organic decay, yet thousands of tons of this most valuable plant food are wasted every year by farmers who do not carry the farm manure out on to the land.

The use of fertilizers must be intelligently governed to produce the best results. To use fertilizer and then plow only to a depth of three or four inches is not giving the plant food elements a chance to do their work. It is a good plan to plow a little deeper each year, till a depth of eight or ten inches is reached. This prevents the lower stratum from packing and souring and gives the roots freedom to collect nutrition from the soil. The requirements of crops in certain soil and climate can only be judged by knowledge of the composition of the soil, and farmers should carefully study these requirements so as to put into the soil the necessary plant food elements in the proportions rendering them most readily assimilated by the plants.

In certain cases commercial fertilizers, while assisting in the production of one crop, may do damage to the actual fertility of the soils. For instance, suppose a farmer applies 200 pounds of mixed fertilizer per acre to his land. This may act as a great stimulant and increase the production, but the larger crop will take more food elements out of the soil than the farmer has put in. To prevent wearing out, he must supply more food than is needed by the crop. The cost of high grade fertilizers, from $38 per ton upwards, renders it an expensive matter to keep pace with the food demands of the crops. Part of this cost may be saved by farmers who will carefully study and mix their own fertilizers while supplementing them with all available farm manures. E.G.M.

Related Subjects. In addition to articles on the ten food products named in the second paragraph, consult the following articles in these volumes:

Agriculture, subtitle Agricultural Education	Manures
	Rotation of Crops
	Soil

FES'TIVALS or **FEASTS,** periods set apart to celebrate some person or event, to rest from labor, or for religious purposes only. Originally all festivals were of the latter character, since the material pleasures connected with them, such as eating and drinking, had to be shared with the gods. The most ancient festivals appear to have been connected with the dead; great banquets were held in their honor, and offerings were made to them. The Greek festivals included the four great national games, Olympian, Isthmian, Nemean and Pythian. The Romans celebrated the Saturnalia, Cerealia, Lupercalia and others. Among the Roman Catholic feasts are the following:

Sabbath	Christmas	Annunciation
Easter	Ascension	Purification
Epiphany	Pentecost	

Feasts are immovable and movable as to dates; the former are those which fall on the same day every year; the latter are those whose dates vary. The principal feast of the latter class is Easter, which determines the time of many of the others. See Easter; Christmas, etc., also Holiday; Olympian Games.

FES'TUS, Porcius, the successor of Felix as ruler of the province of Judea in the reign of Nero, who appointed him about A. D. 60. He held the place for only two years, when he died. In New Testament history he is mentioned in connection with the case of the Apostle Paul, who had been held a prisoner by Felix. When Paul came before Festus for trial, the latter, who wished to please the Jews, tried to induce Paul to go to Jerusalem for a final hearing, but the Apostle appealed to Caesar, which was his privilege as a Roman citizen, and so was sent to Rome (*Acts* XXV).

FETISH, *fet'ish,* a word from the Portuguese, first applied to objects of worship among the savages of Western Africa. It is descriptive of any material thing credited by the uncivilized with mysterious powers, whose possession can secure for them the services of the spirit lodged within it. Any object may become a fetish providing it can be associated with an event as its cause. Fetish worship, which is the lowest form of religion among savages, exists among the negroes of Africa, the Polynesians, Australians and Siberians. The mascots carried by gamblers and other superstitious persons correspond to the fetishes of the barbarians.

FEUDAL, *fu'dal,* **SYSTEM** or **FEUDALISM,** *fu'dal iz'm,* in European history, one of the most important institutions of the Middle Ages, a form of society and government based on the ownership of land. In the latter part of the fifth century, Gaul, the country roughly corresponding to modern France, was conquered by a race of people known as the Franks, who divided the land among themselves, the king keeping the largest share. As the turbulent and unsettled conditions of that period made it impossible for the king to rule so extended a kingdom, he divided his estates among his warriors, each of whom was given the authority of a sovereign on his own domain. These warriors bound themselves to give military aid to their lord whenever they were called upon to do so; in this agreement are found the germs of the institution which became a definite system about the ninth century, and which reached its highest stage in the eleventh, twelfth and thirteenth centuries.

Development of Feudalism. Feudalism developed rapidly after the breaking up of Charlemagne's great empire, for all classes were glad to put themselves undier the protection of a system that would save them from the lawlessness that then prevailed. Kings and princes gave over their estates to feudal lords, who in turn granted sections of land to lesser tenants, and so on down.

Land so granted was called a *fief,* or *feud.* The grantor of a fief was called *lord, suzerain,* or *liege;* the one who received it, *vassal, liegeman* or *retainer.* The vassal made pledges of loyalty, military service and other aid to his lord, and the lord in turn promised his vassal counsel and protection. Lowest in rank of the several classes, and forming the great bulk of the population, were the *serfs,* who were bound to the soil and who passed with the land when it changed masters.

The feudal system became most thoroughly developed in France, Germany, Italy, Northern Spain, England and Scotland; its cradle was the empire of Charlemagne.

Its Decline. As a system of government, feudalism passed into history with the Middle Ages. Important causes which led to its decay were the opposition of the kings and common people to it, the Crusades, the growth of cities and the introduction of firearms in warfare. The common people opposed it because it gave them no opportunity to advance; the kings hated it because it restricted their power. During the period of the Holy Wars large numbers of the feudal lords lost their lives, and others lost their fortunes and their estates, which so weakened the power of the nobility that the system received thereby a crushing blow.

As the cities grew in power and influence they became strong enough to resist the tyranny of the lord of whose fief they were a part, and in some instances they formed independent governing bodies. The introduction of firearms hastened the decline of the system, because it made the common foot-soldier the equal of the armorclad knight in warfare, thus destroying the military supremacy of the feudal aristocracy.

Its Strength and Its Weakness. In the protection it gave to society during the lawless period following the breaking up of Charlemagne's empire, feudalism rendered its greatest service to European civilization. "It was

the mailed feudal horseman," writes one historian, "and the impregnable walls of the feudal castle that foiled the attacks of the Danes, the Saracens and the Hungarians." Again, tyrannical rulers like King John of England were held in check by the powerful feudal lords, and in this way the spirit of liberty was kept alive during the Middle Ages. Feudalism also fostered the literary tendencies of the period, for in the castles of the feudal lords the wandering bards of medieval times poured forth their songs and romances to eager and hospitable listeners. Honor and respect for women were fostered by the great system of chivalry, the military institution of the feudal organization.

Feudalism was conspicuously weak in that it hindered the growth of strong central governments. This is notably illustrated in the condition of France in the tenth century, when the country was divided among about one hundred and fifty great lords, whose estates were subdivided in turn into about 70,000 smaller holdings. Each of these lords was himself a petty sovereign, and the power of the king was correspondingly weak. Another serious defect was the separation of society into distinct classes, which checked the progress of civilization. The great democratic movements of the modern period would have been impossible under the workings of the medieval system of feudalism. B.M.W.

Consult Abdy's *Feudalism, Its Rise, Progress and Consequences;* Prutz's *Age of Feudalism and Theocracy.*

Related Subjects. There is an illustration connected with this subject in the article Chivalry, page 1359. The reader is also referred to the following titles in these volumes:

Charlemagne	Crusades
Chivalry	Serfs

FE'VER, or rise in the temperature of the body, is an accompaniment of a wide range of diseases; in some of these high temperature is an outstanding symptom, and the word is used as a part of the name in each case; thus we have the terms *scarlet fever, yellow fever, typhoid fever,* etc. Fever is always the result of a disease process which is due partly to chemical changes occurring in the cells, and partly to disturbances of the nervous system produced by toxins of the disease. In every case of fever more heat is being manufactured than is radiated or otherwise lost. The rise above the normal (98.6° F.) may reach 105° or over in certain diseases, and victims of sunstroke sometimes show a temperature of 112° or 115°. The instrument used for ascertaining body temperature is a specially-devised thermometer which is placed in the patient's mouth.

The period of *invasion,* as the first stage of fever is termed, is marked by weakness, languor, loss of appetite, rapid pulse and a chill; then follows the period of *domination,* with the pulse remaining rapid, the surface of the body becoming hot, dry and flushed, and the temperature steadily rising. Thirst, headache, restlessness and rapid breathing are typical symptoms of this fever stage. During the period of *decline* the temperature falls, the breathing becomes less rapid, the skin becomes moist, and the patient begins to feel better. At the height of the fever the patient often suffers from delirium, but during the decline he usually falls into a natural sleep.

There are several types of fever. The name *continued* is applied to that in which the temperature remains above normal for several days; *intermittent* is used when the temperature drops to normal and then rises again after varying intervals; the fever is styled *remittent* when the temperature falls to a point above normal and then rises, such a change occurring a number of times for several days. A decreasing fever may reach the normal and the temperature may rise again after an interval of a few days; such a fever is known as *relapsing.* Treatment depends on the particular ailment from which the patient is suffering. W.A.E.

See the article DISEASE for complete list of all fevers discussed in these volumes.

FE'VERFEW, a favorite plant in the gardens of the Pilgrim Fathers in Plymouth, now common in all waste places and in the vicinity of hedges. The flowers, much like the ox-eye daisy, are white or cream with yellow centers. They grow in large clusters and are sometimes double; they last long after picking and make a pleasing decoration. The plant has a tapering root, an erect, branching stem about two feet high, and grayish-green compound leaves. The feverfew, meaning *flight to fever,* was once supposed to be an unfailing means of driving away fever.

FEZ, the capital of Morocco, in Northern Africa. It is beautifully situated in a deep valley eighty-five miles south of the Mediterranean Sea and 100 miles east of the Atlantic Ocean, and is divided into two parts, old and new Fez, by the river of the same name. The streets are narrow and dirty, and though at

a distance the town presents a most picturesque appearance it is disappointing on nearer view. When the streets become too dirty to be longer endured water is turned into them through conduits from the river.

Fez conducts an extensive trade by caravan with the interior, and is noted for its manufactures of woolen cloaks, silk shawls, and handkerchiefs, the red caps named for the town (see below), firearms, swords and leather goods. The city was formerly a center of Arabian learning, but there remain few signs of its former glory. The newer portion of the town is occupied by the government officials and employees and Jewish merchants. The old Fez, surrounded by ruined walls, contains the business district, each industry being confined to its own particular section. Population about 100,000. See Morocco.

Fez, a brimless red cap ornamented with a colored tassel of silk or wool, named after the town of Fez, where it was originally manufactured. It is now worn in Turkey, Egypt and all North African countries, where it is called a *tarbush*. It was long supposed that the dye used for producing the dull crimson color could not be obtained except in Morocco, where it is made from the juice of red berries. It has now been chemically produced, and the caps are made in France and Turkey.

FI'AT MONEY. A gold piece has a market value equal approximately to the amount stamped upon its face; a five-dollar gold piece is worth five dollars, either in the form of a coin or melted into a mass. Any other coin has a certain intrinsic value; and most paper money, as greenbacks and gold or silver certificates, is of value because it is a "promise to pay" and may at any time be exchanged for coin of standard value. *Fiat* money will pass as money merely because a government has said it must be accepted as money. It has no coin behind it to give it value, but a government has said, "Let it be money," and it at once acquires a certain value, which it continues to hold as long as people have confidence in the government. The Latin word *fiat* means literally *let it be*.

It might seem that the creation of fiat money would be an easy way for a state to prevent money scarcity and hard times, but since it is itself a confession of scarcity of money, it cannot produce confidence. No other country will accept it as money, and its value rapidly depreciates. In early times in America the colonies more than once issued fiat money, though it was not called by that name, but it soon proved to be worthless. In 1915 the Carranza government in Mexico issued millions of dollars worth of paper money, and when the success of the Carranza cause was in doubt, this money, without redemption value behind it, depreciated until it was worth but a few cents on the dollar. To-day no state of any importance believes it possible to solve its problems or lessen its distress by means of fiat money.

FI'BER, any vegetable, animal or mineral substance which may be separated into threads for spinning, weaving, or for use in various manufactures.

Vegetable Fibers. Most important of the fibers are those obtained from things which grow from the soil. From them are made many of the articles which we wear and use. *Cotton* fiber is perhaps the most common example. It is that woolly substance surrounding cotton seed which, after passing through various processes of cleaning and manufacture, comes to us as cotton batting, thread, yarn or cloth.

The *flax* from which linen thread and linen are made is another important plant fiber. It comes from the stem of the plant. *Hemp,* similar to flax, but tougher and coarser, is used for cordage, rope and coarse cloths. From Manila hemp wrapping paper and cheap writing papers are made, as well as matting, canvas and ropes. *Jute* furnishes a strong bark fiber used for bagging, canvas and carpets. One of the most durable of vegetable fibers is that from the stems of *ramie,* or China grass; from it are made cordage, nets, various fabrics and paper. Chinese grass is valued especially for banknote making. Paper is made from various wood fibers, as well as from fibers of corn husks and of esparto grass.

Among the coarser fibers are *raffia,* used for baskets and mats; and palmetto, tampico and cocoanut fibers, for brushes. *Broomcorn* is also classed by manufacturers as a brush fiber. Palm fibers are manufactured into various articles, and from fiber of young leaves of the jipijapa are woven Panama hats. The finest textile fibers are grown in temperate climates, and nearly all others of commercial importance are obtained from tropical or semi-tropical countries. Each of the fiber plants mentioned above is described under its appropriate title in this work. See, also, Cloth; Paper; Weaving.

Animal Fibers. Wool and silk constitute the

only valuable animal fibers. Under the term wool is included, besides the hair of sheep, that of the alpaca, the Angora and other species of goats, as well as the hair of the camel, musk-ox and yak. All are described in this work under their individual titles. From wool fibers are manufactured many warm articles of wearing apparel. Silk fiber is obtained from the silkworm (see SILK), and comes to us in the form of silk thread and silk fabrics.

Mineral Fibers. Asbestos furnishes the most perfect example of mineral fiber, and its uses are described under that title. Various metals, however, are drawn into fine lengths and woven into fabrics (see GOLD LACE), and glass is spun into a fiber and used in manufactures. M.S.

FI'BRIN, a tough, elastic, jellylike substance found in animal matter. It is fibrin that causes the clotting of blood when it is exposed to the air. When a drop of freshly-drawn blood is examined under the microscope, little strings of solid matter may be seen forming in the watery part and entangling the corpuscles. These threads, which consist of fibrin, are formed by the action of a ferment upon a proteid substance in the blood called *fibrinogen* (see BLOOD).

Fibrin itself is a proteid; that is, a substance consisting of carbon, hydrogen, oxygen and nitrogen (see PROTEIDS). It may be obtained by switching a newly-formed blood clot with a bundle of twigs. Fibrin mixed with other substances will cling to them in threads, and to free the fibrin from impurities it is necessary to rinse it in cold water and then to boil it in alcohol and ether. A substance somewhat resembling animal fibrin is extracted from corn, wheat and other grains, and is known as vegetable fibrin.

FICHTE, *fiK'te,* JOHANN GOTTLIEB (1762-1814), a German philosopher whose influence has been most strongly felt in the later development of German philosophy. He was the son of a poor ribbon-weaver, and his early education was provided for by a wealthy nobleman who was impressed by the boy's evident ability. He studied theology and philosophy at the universities of Jena and Leipzig, then spent several years in tutoring. In 1791 he went to Königsberg, where he met Kant and was encouraged by him to publish his *Critique of All Revelation.* The outcome of this incident was his appointment in 1793 to the professorship of philosophy at Jena. During his five years there he continued to publish his philosophical views, but was forced to resign in 1798 because some of his theories were considered opposed to accepted religious beliefs. For several years thereafter he lectured in Berlin, in 1805 became professor of philosophy at Erlangen and four years later was appointed to the chair of philosophy in the newly-founded University of Berlin. There he remained until his death.

Fichte's philosophy is based on the principle that each person forms his own idea of the external world, but that each one tends to accept as true the same phenomena that are observed by the senses of others. His theory of education, that the chief aim of instruction should be to develop character, has been highly regarded. See KANT, IMMANUEL; PHILOSOPHY.

FICTION, *fik'shun.* The child who demands that somebody "make up a story" for him is calling literally for fiction, since fiction means just that—something *made up.* So far as the derivation is concerned, then, the word might be used to describe many kinds of literature, for poems and dramas are "made up" as surely as are stories. In common use, however, it is restricted to one form of literature—to prose narratives of imaginary events and characters. But there are differences in such narratives. Some could never possibly have happened—they deal with the supernatural, the marvelous, and make no pretense at being true to life. Such are fairy tales and many of that class of longer stories known as romances. The novel, on the other hand, and most of the short stories which com-

prise so large a part of present-day reading matter, deal principally with everyday incidents in the lives of characters who are drawn as true to life as possible.

Prevalence of Fiction. Different ages express themselves in different literary forms. The Elizabethan Age (1558-1603) spoke primarily through the drama, the Augustan Age (1700-1740) through the essay or satire, the Romantic Age (1837-1901) through its exquisite lyric poems, the Victorian Age through its wonderful variety of both prose and poetry; and the dominant literary form of the present age is undeniably fiction. Hundreds of works of fiction come from the press every year; some of these are worth reading, some are not; but almost all find readers, for there are vast numbers of people who never read anything else, and who lack discrimination in selection. The demand for fiction at public libraries is far in excess of that for all other kinds of books combined.

Famous Works of Fiction. No two persons, whether they be critics or the most casual readers, would ever agree thoroughly on a list of the greatest works of fiction, but there are certain books which could scarcely be left out of any such compilations. The following list does not claim to be authoritative—it merely names a dozen works of fiction which anyone who aspires to be well-read cannot afford to neglect:

Don Quixote	Cervantes
Robinson Crusoe	Defoe
The Vicar of Wakefield	Goldsmith
Ivanhoe	Scott
Kenilworth	Scott
David Copperfield	Dickens
Tale of Two Cities	Dickens
Vanity Fair	Thackeray
Henry Esmond	Thackeray
Les Miserables	Hugo
Mill on the Floss	Eliot
Scarlet Letter	Hawthorne

The Well-Paid Fiction Writer. Some of the writers of these world's greatest stories would have heard with amazement of the prices paid to present-day novelists for their tales. A beginner, it is true, cannot hope for large returns—he is fortunate if he disposes of his stories at one cent a word. But when an author has become famous and is so popular that there is competition among publishers for the privilege of issuing his works, he may demand almost what he will, with a fair hope of receiving it. It is nothing unusual, for instance, for a writer whose stories are in great demand to be paid from fifty cents to a dollar a word, and it is said that Conan Doyle received for his later Sherlock Holmes tales as much as five dollars a word. That is, for a single page of ordinary magazine size he was paid the astounding sum of $4,000.

How to Read Fiction. An unmixed diet of fiction, novel after novel read hurriedly for the story, cannot fail to result in mental indigestion, but this does not indicate that fiction-reading is harmful. With a little care anyone may acquire a method of reading which will not only make fiction immensely more interesting, but more helpful, as well. This does not require actual study, with a dictionary close at hand, but merely close attention to certain phases and to the way the author has accomplished certain results. The following suggestions should enable one more truly to appreciate good fiction:

The Plot. To most people the "story" is the most absorbing phase of a work of fiction; the more exciting and complicating it is, the deeper is the interest aroused. Some novels or romances place all their emphasis on the *plot*, as it is called, making little or no attempt at character-development or at scenic word painting; others seem to use the plot merely to show the development of character. Either style may be excellently done, but the very best fiction presents a combination of the two. Sometimes a plot consists of but one story, and every incident bears directly upon it; again, a whole series of minor plots may be introduced, which only indirectly affect each other.

In reading fiction, such questions as the following, borne in mind and answered, will make the story clearer and give a feeling of mastery which a more hasty reading cannot produce: Has the story a distinct, outstanding climax, to which all the events lead up? Did the author try to conceal the final outcome, that it might be a surprise to the readers? Was he successful in this, or was the outcome evident? Are there subordinate incidents of considerable importance? How do they contribute to the working-out of the plot? Does the central plot stand out clearly, or is it obscured by a too great wealth of incident? Does the story begin with a series of incidents which are not apparently related to each other, but which at the close are blended together?

The Characters. In almost any story there are one or two persons who stand out most clearly, and about whom the plot is woven. Commonly these are called the *hero* and the *heroine*, though in reality they may be anything but heroic. Other persons, sometimes in considerable numbers, appear and play their parts, but generally these are kept subordinate to the central characters. Nothing shows more clearly the genius of a writer than the ability to draw character well—to create people who live and move, and seem to readers to be real persons, to be admired or disliked. Anyone laying aside a play of Shakespeare's, a story of Dickens's or, among present-day books, an *Old Chester* tale of

Mrs. Deland's feels that he has made acquaintances and friends who will long be remembered.

Some such questions as the following will help in the appreciation of character-studies in books: Do the persons in the story seem real? How does the author accomplish that result? Does he describe his characters in detail, or does he allow the reader to find out much about them from their own conversation and actions? Do they at any time act in a way that seems out of keeping with their general character? Do they grow in the course of the story, or are they the same at the close as at the beginning? Are such changes natural, or are they too sudden and unaccountable to be possible in real life? Is the author more interested in his character-development than in his plot? Has the author favorites among his own characters? Does he succeed in making the reader feel toward them as he does?

The Scene. While lengthy descriptions which retard the movement of a story have no place in fiction, a vivid impression of the setting or of the scene in which events take place may add much to the pleasure of the reader. Does the author make the locality in which his scene is laid stand out clearly? Has his city a distinct individuality? Does his countryside differ in any way from all other countrysides? Does the author know his locality thoroughly? Has he introduced "local coloring"—that is, peculiar features of the landscape, peculiar traits in the characters, dialect, mannerisms, tricks of speech? Does he succeed in giving the "feel" of the place?

The Purpose. Had the author any purpose other than that of entertainment? Did he wish to teach a moral lesson, or merely to portray the life of a certain region or of a distinct period of history? Many a good story has no obvious "moral"; no truly artistic work of fiction ever actually points out one, but if it is true to life and is the work of an earnest writer it is sure to carry its lesson for the thoughtful reader.

At first in reading fiction it will be necessary to have these specific questions in mind; later they will become so completely a part of the reader's mental equipment that they will help him in his analysis of the story without his conscious use of them. One point is worthy of note—not all fiction is worth careful study, and many a story repays no more than a hasty reading; but every reader should take care that he does not read exclusively or chiefly such stories. C.W.K.

Consult Baker's *Guide to the Best Fiction in English;* Dawson's *The Makers of Modern Fiction.*

Related Subjects. The reader is referred to the following articles in these volumes:

English Literature	Novel
Literature	Romance

FIDDLER, *fid'ler,* **CRAB,** a small crab which abounds on the muddy shores along the eastern coast of the United States, south of Cape Cod. The male of the species is distinguished by the enormous development of one of its front claws, which it waves as if fiddling, hence the name. The female has small claws of equal size. These crabs feed on vegetable matter, and are used as bait. They

THE MALE FIDDLER CRAB

throng sometimes in thousands in marshy places, and their burrowing weakens levees and dams. See CRAB.

FIEF, *feef,* from the French, or **FEE,** in English, is a legal term meaning an estate in land which is inheritable, or descending to the heirs of the grantee. The term originated in feudal times and referred to land held from a lord, or superior, conditional upon the performance of service. The term has three divisions: *fee simple,* or absolute ownership of an inherited estate; *fee,* or private ownership; and *fee tail,* or an estate limited to a specified line of descent, which cannot be disposed of at the will of the owner. See FEUDAL SYSTEM OR FEUDALISM.

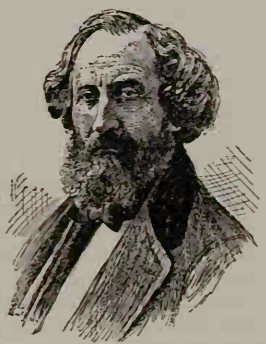
FIELD, *feeld,* the family name of three remarkable brothers, two of whom won distinction in the field of law, and the youngest associated with one of the marvels of modern communication, the submarine cable. They were the sons of David Dudley Field (1781-1867), a notable Congregational clergyman who was the author of several histories dealing with Massachusetts.

David Dudley Field (1805-1894), who was born at Haddam, Conn., and educated at Williams College, held a foremost place among American lawyers as an advocate of law reform. Forty years of a brilliant career which began in 1828 with his admission to the bar of New York were devoted to this cause. In 1847 he began the preparation of a code of civil law which was later adopted by nearly all the states of the Union, and which is the basis of the reformed procedure established in 1873 in England. His writings had far-reaching influence, not only in the field of civil and municipal law, but also in that of international relations. In 1873 he was elected first president of an association which met in Brussels for

the purpose of reforming and codifying the laws of nations.

Stephen Johnson Field (1816-1899) became one of the most distinguished justices of the United States Supreme Court. He was born at Haddam, Conn., and, like his brother David, was a graduate of Williams College. After studying law in the latter's office, he became his partner. In 1849 he made his way westward to the gold fields of California, and after the admission of the state into the Union he rendered notable service as a member of the judiciary committee in the legislature. In 1857 he became judge of the supreme court of California, and two years later, chief justice. Field was appointed Associate Justice of the United States Supreme Court by Lincoln in 1863, and during his thirty-four years of service he handed down opinions that are a valuable contribution to American constitutional law. He was a member of the Electoral Commission of 1876, voting with the minority in favor of Samuel J. Tilden. See ELECTORAL COMMISSION.

Cyrus West Field (1819-1892), the man to whom the laying of the first Atlantic cable is chiefly due, was born in Stockbridge, Mass. Giving up the idea of a college education, he entered business life in New York City, and after a career which held for him both failure and success retired at the age of thirty-three with a fortune of $250,000. In 1854 he became very much interested in telegraphic and cable possibilities, and in that year organized a company, with Peter Cooper as its president, to lay a cable from Newfoundland to Ireland. The first attempts were failures, but in 1858 a cable was laid which worked successfully for four weeks. See CABLE.



CYRUS W. FIELD
Who shortened communication with Europe from over a week to less than a minute.

In the meantime Field's firm went into bankruptcy in the financial panic of 1857, and the enterprise was abandoned until the close of the War of Secession. Field, who had never lost faith in the success of the undertaking, began his efforts anew in 1865, chartering the *Great Eastern*, the largest steamship on the seas, to lay a new cable. The work was completed on July 27, 1866, and this effort proved a triumphant success.

In recognition of his services, Congress gave Field a unanimous vote of thanks and awarded him a gold medal. He thereafter devoted much of his energies to railroad development, and was one of the original promoters of the elevated railroad system of New York City.

FIELD, EUGENE (1850-1895), an American author and humorist, one of the best-loved writers of poetry for children. The Little Boy Blue, who owned the "toy dog covered with dust," the gingham dog and the calico cat that ate each other up in a terrible duel and the boy who was always "seein' things at night" are familiar to countless numbers of children. Taken as a whole, his work reveals a man of most engaging personality, whose boyish gayety, enthusiastic love for children and animals and capacity for friendship are always in evidence.

EUGENE FIELD

The author of *Little Boy Blue* was born in Saint Louis, Mo., on September 3, 1850. When he was seven years old his mother died, and he and his younger brother were placed in care of a cousin, Mary Field French, who lived in Amherst, Mass. There he was prepared for Williams College, which he entered in 1868. A year later he became a member of the sophomore class of Knox College at Galesburg, Ill., but he completed his education at the state university of Missouri. In 1872 he visited Europe, spending, to use his own words, "six months and his patrimony in France, Italy, Ireland and England."

In 1873, after his return to America, Field became a reporter on the Saint Louis *Journal;* this was the beginning of a successful newspaper career. For the next ten years he won favorable notice for his work on various papers in Saint Joseph and Kansas City and in Denver, but his widest reputation was made as writer of a humorous column in the Chicago *Morning News* (later the *Herald*). This column, which was entitled "Sharps and Flats,"

expressed completely his many-sided talent—the ability to write by turns the quaint, the grotesque, the farcical, the sentimental and the pathetic. It was often unexpectedly varied.

In the midst of his journalistic work he found time to write the exquisite poems of childhood that are especially associated with his name. These have been published under the titles *With Trumpet and Drum* and *Poems of Childhood. A Little Book of Western Verse* and *A Little Book of Profitable Tales* represent his finest literary productions. His classical tastes are revealed in his translations of the poet Horace, entitled *Echoes from the Sabine Farm,* and in a volume of essays, *The Love Affairs of a Bibliomaniac.*

The custom of holding Eugene Field exercises and entertainments in the schools is growing in favor both in America and in England. *The Eugene Field Book* contains representative poems of the gifted author, and many interesting facts about his life and personality. It is designed to assist teachers who wish to prepare Eugene Field programs.

This poet of tender fancy and whimsical humor has written some of the most beautiful lullabies and cradle songs in American literature. A favorite among these is the *Norse Lullaby,* two stanzas of which follow:

> The sky is dark and the hills are white
> As the storm-king speeds from the north
> to-night,
> And this is the song the storm-king sings,
> As over the world his cloak he flings:
> "Sleep, sleep, little one, sleep";
> He rustles his wings and gruffly sings:
> "Sleep, little one, sleep."
>
> On yonder mountain-side a vine
> Clings to the foot of a mother pine;
> The tree bends over the trembling thing,
> And only the vine can hear her sing:
> "Sleep, little one, sleep;
> What shall you fear when I am here?
> Sleep, little one, sleep."

At an Allied Bazaar in Chicago in January, 1917, for the benefit of Europe's war sufferers, the original manuscript of *Little Boy Blue* sold at auction for $2,400. B.M.W.

FIELD, MARSHALL (1835-1906), a great American merchant, founder of the largest department store in the world and of one of the greatest wholesale dry goods establishments. He was born at Conway, Mass., and received an academy education. At the age of seventeen he began business life as a clerk in a dry-goods store at Pittsfield, Mass., removing to Chicago in 1856. Four years later he became senior partner of the firm of dry-goods merchants which in 1865 consisted of Marshall Field, Potter Palmer and L. Z. Leiter. His partners having retired in 1881, Field became head of the firm, known thereafter as Marshall Field & Company, with wholesale and retail establishments. The retail department store, which occupies an entire block, with an additional building, or "store for men," in the center of the merchandising district of Chicago, surpasses any other store of its kind in the world, both in size and in equipment. Mr. Field once told an audience of young men they would be successful if they were right in their conclusions fifty-one per cent of the time; he was almost unerring in his own decisions, and this, coupled with an early determination in his career to give good values for the prices he charged, may be considered the keynote of his success.

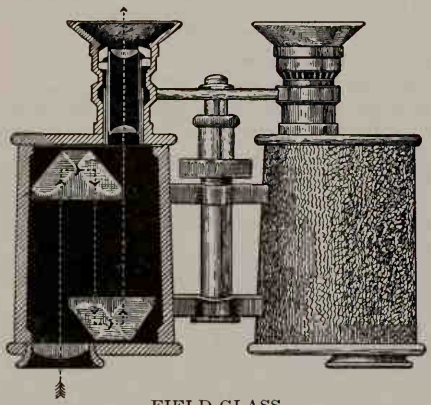
The bulk of Field's great fortune of from $120,000,000 to $150,000,000, largely invested in choice real estate, was left in trust for his two grandsons. About $8,000,000 was willed to the Field Columbian Museum, of which he was the founder. See FIELD COLUMBIAN MUSEUM.

FIELD COLUM'BIAN MUSEUM. In 1894, at the close of the World's Columbian Exposition, held in Chicago, Marshall Field, one of the leading merchants of that city, gave $1,000,000 for the founding of a museum of natural history, to be called the Field Columbian Museum. Material which had been on exhibition during the Exposition was acquired by gift and purchase, and the Fine Arts building of the Exposition, situated on the Exposition site in Jackson Park, was secured as a temporary home for the museum. When Mr. Field died, in 1906, he bequeathed the institution $4,000,000 for the erection of a permanent building, and $4,000,000 as an endowment fund. In 1915 work was begun on this new home, a site having been secured on the shore of Lake Michigan, in the vicinity of Twelfth Street, near Chicago's great business center.

Much of the original material of the museum has been rearranged or discarded. At the present time the museum is divided into these departments are complete and repreogy and zoölogy, and its study collections in these departments are complete and representative. The results of various scientific expeditions sent to different parts of the world are published from time to time, and each year two courses of free lectures are given. Among the important features of the museum are departmental laboratories, a library of about

63,000 titles and a well-equipped printing shop. In 1913 arrangements were made whereby the work of the museum could be carried on in connection with the Chicago public schools. The institution is managed by a board of trustees, and is incorporated.

FIELD GLASS, a small instrument for viewing objects at a distance, possessing considerable magnifying power. It is in general use by military men, naturalists, tourists and sportsmen. The field glass most commonly



FIELD GLASS
Cross section shows construction of reflecting prisms. Glasses of this kind are commonly called *binoculars* (having two eyes).

used consists of two telescopes, varying from five to ten inches in length, and having an arrangement of reflecting prisms within the tubes (see illustration). Field glasses are made in four different powers, magnifying respectively three, six, nine and twelve diameters. A glass magnifying six diameters would increase the surface of the object viewed thirty-six (6^2) times, one magnifying nine diameters would increase it eighty-one times, and so on. Glasses with a power of twelve diameters are used especially by naturalists and military officers. See TELESCOPE; OPERA GLASS.

FIELDING, HENRY (1707-1754), a celebrated English novelist and playwright, who has been called by his admirers the father of the modern novel. He was born at Somersetshire, studied at Eton, Leyden and the Middle Temple, London, and was admitted to the bar in 1740. Play-writing was the first step in his literary career, and he is said to have completed at least twenty-five comedies during a period of ten years. *Love in Several Masks* was the first to be produced, and this was soon followed by *Temple Beau* and the *Modern Husband.* These, while clever and amusing, have not the merit and originality of his novels. The latter include his masterpiece, *Tom Jones,* said to be a history of his own life, *Amelia, Joseph Andrews, Jonathan Wild* and others now less known. His style, while displaying the coarseness of the period, is distinguished by a remarkable descriptive ability and much wit and wisdom.

FIELD'ING, WILLIAM STEVENS (1848-), a Canadian journalist and statesman, premier of Nova Scotia from 1884 to 1896 and Dominion Minister of Finance from 1896 to 1911. During his fifteen-year service as Minister he was largely responsible for the financial policy of the Liberal party, and even after his retirement from the House of Commons in 1911 he remained its chief financial adviser. He personally introduced or was responsible for many of the bills of the Laurier Ministry, including the moderately protective tariff of 1897, noteworthy for its clause granting preference to British manufactured goods. At various times he represented the Dominion on imperial commissions and at important conferences in London, and between 1907 and 1911 negotiated commercial treaties with France, the United States, Germany, Italy and Belgium. He secured the installation of the Ottawa branch of the Royal Mint in 1901, and in 1903 established the penny-bank system. In 1903, while acting temporarily as Minister of Railways and Canals, he conducted negotiations which resulted in the construction of the National Transcontinental Railway. The reciprocity treaty which he negotiated with the United States in 1911 was responsible for the fall of the Laurier Ministry and his own defeat for reëlection to the House of Commons (see CANADA, subtitle *History*).

Fielding was born at Halifax, Nova Scotia, attended the public schools of that city, and in 1864 became a reporter on the Halifax *Morning Chronicle,* of which he later became managing editor. This paper was the leading Liberal organ in Nova Scotia. Fielding was elected to the provincial assembly in 1882, and two years later became premier of the province. He resigned in 1896 to accept election to the House of Commons and a seat in the Laurier Ministry. He declined the honor of knighthood in 1902, and later returned to his old field of journalism in Montreal. G.H.L.

FIELD OF THE CLOTH OF GOLD, a location in the Valley of Andren, between the English castle of Guisnes and the French castle

of Ardres, celebrated for the meeting in 1502 of Henry VIII of England and Francis I of France and their retinues. The conference, which was planned by Cardinal Wolsey to give the two monarchs an opportunity to discuss an alliance against Charles V of Spain, was remarkable chiefly as a magnificent historic pageant, with unimportant political results.

FIFE, a six-holed wind instrument resembling the flute and piccolo, but differing from the latter in that it has no keys. Its compass is two octaves, and it is pitched in various keys. Its clear, shrill sound is produced by blowing

A FIFE

into a hole near the closed end of the tube. The fife is of ancient origin, and has always held its place with the drum as an appropriate instrument for military music. One of the most inspiring paintings is *The Spirit of '76,* picturing a grandfather, son and grandson, playing on snare drums and a fife, leading the tattered American Continentals in battle.

FIFTEEN DECISIVE BATTLES. Of all the many great battles in the history of the world, there had been, down to the year 1850, in the opinion of Sir Edward Creasy, fifteen which actually changed the course of history. In his *Fifteen Decisive Battles of the World,* published in 1851, he described these and pointed out the special significance of each. They are the following:

(1) **Marathon** (490 B. C.). In this battle the Greeks, with Miltiades as their chief leader, defeated the hosts of Darius I, the Persian king. These Asiatic hordes had been regarded as unconquerable, but this battle proved the superior ability of the Western armies and turned back the tide of Asiatic civilization which had been creeping steadily westward. See MARATHON.

(2) **Syracuse** (413 B. C.). The expedition of the Athenians in Sicily ended most disastrously, and the extension of Greek rule to the westward was checked. Because of this Athens lost its dominant position in Greece, and the way was prepared for the successive dominations of Sparta, Macedonia and Rome.

(3) **Arbela** (331 B. C.). Alexander the Great defeated Darius III of Persia, and made it clear that European and not Asiatic civilization was to control the future. See ALEXANDER THE GREAT.

(4) **Metaurus** (207 B. C.). Hasdrubal, brother of Hannibal, the Carthaginian foe of Rome, had collected a large army which he was leading to the help of his brother. At the Metaurus River he was defeated and his army was destroyed by the Romans, and Hannibal's withdrawal and the overthrow of Carthage followed. See PUNIC WARS.

(5) **Teutoburg Forest** (A. D. 9). Here Arminius, a German chieftain, defeated and practically destroyed a Roman army under Varus, thus making impossible the subjugation of Germany by the Romans.

(6) **Chalons** (451). The Huns under Attila were sweeping over Southern Europe, blotting out the civilization of centuries, but at Chalons they were routed by the Romans and Visigoths, and a large part of the continent was saved from devastation at their hands.

(7) **Tours** (732). Here Charles Martel (the "Hammer") defeated the Saracens and turned back the tide of Mohammedan invasion which was threatening to sweep over Europe as it had swept over Western Asia and Northern Africa. But for this battle Christianity in Europe might have been blotted out.

(8) **Hastings** (1066). This was the battle from which so much in English social, political and literary life dates—the battle in which William the Conqueror overthrew Harold. From this time on the Normans and not the Saxons were dominant in England until the two peoples merged into one.

(9) **Orleans** (1429). France was in a position where one more defeat would have subjected it entirely to England, but Joan of Arc compelled the English to raise the siege of Orleans and so made possible the coronation of the French king and the gradual wresting of France from the grasp of England. See JOAN OF ARC.

(10) **The Spanish Armada** (1588). This huge fleet had as its object the invasion of England and the restoration of Catholicism there. Its defeat saved England and its colonies to the Protestant faith. See ARMADA.

(11) **Blenheim** (1704). In his poem on the *Battle of Blenheim,* Southey writes:

> "But what good came of it at last?"
> Quoth little Peterkin.
> "Why, that I cannot tell," said he;
> "But 't was a famous victory."

But Creasy gives clearly enough the significance of this battle; it checked the ambitious schemes of Louis XIV of France, and saved Europe from the possible domination of that country.

(12) **Pultowa** (1709). By his defeat of Charles XII of Sweden in this battle, Peter the Great not only made clear the fact that it was Russia and not Sweden that was to control the destinies of Northern Europe, but established the Russian Empire more firmly and opened it up to the influences of European civilization.

(13) **Saratoga** (1777). Here the American colonists, under Gates, defeated the British under Burgoyne. Perhaps the most important result of the victory was the determination of France to aid the Americans—an event which proved practically the turning-point in the Revolutionary War. See REVOLUTIONARY WAR IN AMERICA.

(14) **Valmy** (1792). Had the French been defeated in this battle by the allied Prussians and Austrians, the French Revolution would probably have died out, but this early victory encouraged the revolutionists and they persisted until their demands were granted. See FRENCH REVOLUTION.

(15) **Waterloo** (1815). Napoleon was finally defeated by the allied forces under the Duke of Wellington, and Europe was freed from his ambitious demands. See NAPOLEON I.

Later Crises. Many of the battles named above all historians agree in regarding as turning-points, but as to others opinions differ. Later battles, too, must rank as equally decisive, those of Gettysburg (1863), Manila (1898) and Mukden (1905) having been particularly important. It is probable that some future historian, looking backward, may count the Battle of the Marne, the Battle of Verdun or the Battle of the Somme, or some other conflict in the great War of the Nations among the most decisive struggles the world has ever seen. See WAR OF THE NATIONS.

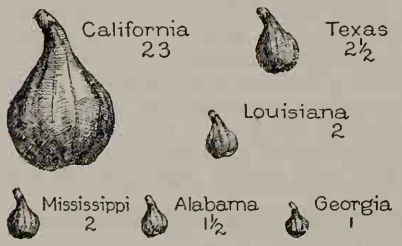
Sir Edward Shepherd Creasy (1812-1878) is remembered chiefly for the book discussed above, though he wrote several other historical works not unworthy to rank with it. His *Historical and Critical Account of the Several Invasions of England, History of the Ottoman Turks* and *Imperial and Colonial Constitutions of the British Empire* show a breadth of learning and true historical judgment. Creasy was born at Bexley, in Kent, studied at King's College, Cambridge, practiced law, and in 1860 went to Ceylon as chief justice.

FIG, commonly seen in its dried state as a light or dark brown sugary pulp with slightly tough exterior, filled with little golden edible seeds. It grows on trees about fifteen or twenty feet high. The leaves are deeply lobed, and the so-called fruit, when ripe, is pear-shaped, green, yellow, red or blue-black. It is

THE FIG
Branch of the tree; and fruit, showing cross section.

eaten fresh with sugar and cream, also when canned or preserved, or in a dried state. Figs are more nourishing dried than when fresh, being almost as nutritious as dates. Stewed, they are more nourishing than apple sauce.

Figs have been known since the earliest times, references to them occurring frequently in the Bible, as "Do men gather figs from thistles?" Every ancient householder was supposed to cultivate at least a few trees, and from this

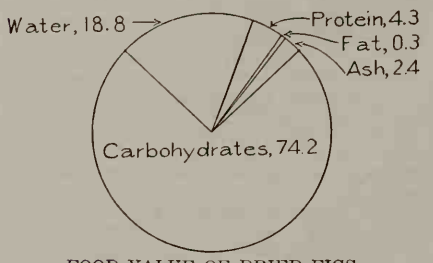


Figures Represent Millions of Pounds
A YEAR'S PRODUCTION
The fig industry in the United States is yearly on the increase.

custom arose the expression "under his own vine and fig tree," denoting a home.

There are over one hundred kinds, most of them grown in the countries around the Mediterranean Sea, but certain varieties are also cultivated in the Southern and Western states of America, especially in California.

Smyrna Figs. The successful raising of the Smyrna fig, the most delicious variety, depends upon the presence of the fig-wasp, a parasitic insect. A fig, unlike most fruits, does not develop from a flower, but is itself the container of the flowers, which are crowded thickly on its inner surface. At the bases of the flowers of the inedible, wild capri-fig, the fig-wasp's eggs are laid, and within the fig the new generation of wasps hatches and develops.



FOOD VALUE OF DRIED FIGS
The fuel value of figs is about 1,500 calories per pound. This is one-half greater than that of sirloin steak, nearly equal to that of beans, and almost three times that of peas.

If a branch from the capri-fig tree is suspended in a Smyrna tree, the female wasp, crawling about within the figs in search of a place to lay her eggs, will distribute the pollen of the male flowers of the fig from which she

came to all the female flowers of the Smyrna fig. But the Smyrna flowers are not suitable for hatcheries, and the wasp returns again to the wild fig without depositing her eggs. Thus fertilized with the pollen of the wild fig, the Smyrna fruit grows large and sweet; otherwise, though the trees bear heavily, the figs will be lean and unattractive. A California fruit grower tried more than ten years to introduce the fig-wasp from the Orient; his success has made the California fig equal the original Smyrna fruit in quality.

The annual average output of figs in California is now in excess of 23,000,000 pounds per year (10,000,000 pounds after drying). Figs are among the most expensive of dried fruits, and are valued at $200 to $400 a ton in the great city markets. C.H.H.

FIGARO, *fe ga ro',* a type of character of clever adroitness, first introduced on the French stage about 1785, by Beaumarchais, as the hero of his comedies. In the *Barber of Seville* he is a barber, cunning and witty; in the *Marriage of Figaro* he is a clever valet and finally outwits everybody. The dramatic character of Figaro seized the popular imagination of the day and became the name for daring, cleverness, roguery and intrigue. One of the principal journals of Paris, founded in 1826, was named *Le Figaro;* it had Paul La Croix, Jules Sandeau and George Sand among its contributors. This journal was suspended in 1833 but was revived by Willemessant in 1854 and is yet in existence.

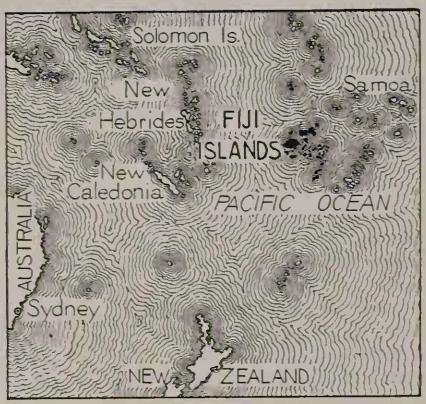
FIG'URE OF SPEECH. When a great author writes "Lend me your ears," or the enthusiastic youth exclaims, "You're a brick, dad!" neither means literally what he says, and yet both express their meaning more forcibly than would have been possible in the expression, "Listen to me," or "You are a very satisfactory parent." The use of words in any but their literal meaning is known as a *figure of speech.* Frequently figurative expressions are very beautiful; they form the chief ornaments of poetry, as when the Psalmist chants "The Lord is my rock and my fortress," or Shelley sings how—

> That orbèd maiden, with white fire laden,
> Whom mortals call the moon,
> Glides glimmering o'er my fleece-like floor
> By the midnight breezes strewn.

Figures of speech are more commonly used than one would believe who has not studied the question. Such oft-heard expressions as "He dropped his eyes," "the raging sea," "pretty as a picture," "he addressed the chair," "all hands on deck" and "a speaking likeness" are figures as truly as are the more elaborate ones of the poet. The chief kinds of figures—metaphor, simile and metonymy—are treated in separate articles in these volumes.

The figures referred to above are really only one class of figures of speech, and are more exactly called figures of rhetoric. In addition there are two other classes which are of grammatical form rather than of thought, and are known as figures of etymology and figures of syntax. The former concern themselves with the forms of words and consist largely in the use of such elision or contractions as *o'er* for *over, won't* for *will not* and *'tis* for *it is;* while figures of syntax are variations in sentence construction. Figures of syntax are in common use, especially the form which consists in leaving out a word or several words which are really essential to the grammatical completeness, the object being an increase in forcefulness. *Hats off!* for instance, is more effective than *Take your hats off; Here!* than *Come here!* and *Down!* than *Sit down.* A.MC C.

FIJI, *fe'je,* **ISLANDS,** Great Britain's most important possession in the South Pacific Ocean. There are about 250 islands, only eighty of which are inhabited. They cover a total area of 7,435 square miles, and are of



FIJI ISLANDS

volcanic origin, with peaks rising to about 4,000 feet above the sea. Streams are abundant, and the soil is very fertile, producing great quantities of fruits, corn, tobacco and sugar cane. Cocoanut palms abound, the dried kernels, called copra, being the principal export (see COPRA). The chief occupation is agri-

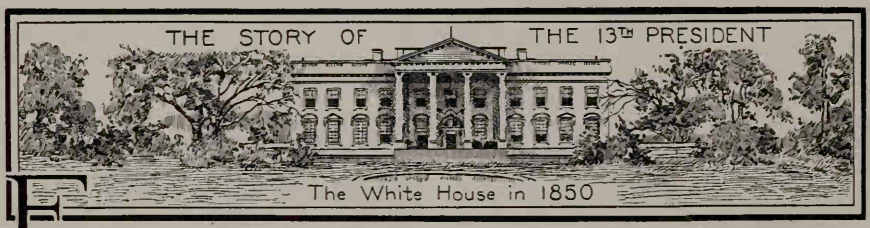
culture, though the fisheries are important. The only wild animals native to the islands are rats, but domestic animals of all kinds have been introduced.

Until recent years the inhabitants, who were formerly notorious cannibals, adhered to their own pagan religion, the principal feature of which was ancestor worship. So deeply-rooted was cannibalism that for human flesh the Fijians would sacrifice parents or children. The eating of "long pig," as human flesh was called, was a religious duty; so whether the victim happened to be friend or foe was of little importance. The greater number of the natives have now embraced Christianity and have proved themselves quick in adopting civilized manners and customs. Only two of the islands are of fair size, Viti Levu, on which stands the capital, Suva, and Vanua Levu. The islands are administered by a governor and council, the native chiefs being given a voice in legislative affairs. Population in 1911, 139,541.

FILIBUSTERS, *fil'i bus terz,* a name handed down from the buccaneers, or seventeenth century piratical rovers. The term was first applied in America to the adventurers in the middle of the nineteenth century, who organized expeditions in the United States, in defiance of international law, to gain control of Cuba and some of the Central American states. In 1853 William Walker of Tennessee made raids into Nicaragua and fomented revolutions, but he was captured in Honduras, court-martialed and shot.

Filibustering expeditions also sailed from New Orleans to Cuba, led by Narcisco Lopez, but they all came to naught. Such expeditions have become exceedingly rare during the last quarter of a century, the last to be called by that name being the Dr. Jameson raid, which in 1895 tried to overthrow the Boer government in South Africa.

The term has come into vogue in more modern times to designate legislative members who are in the minority, who try by making irregular parliamentary and dilatory motions to prevent the adoption of measures favored by the majority. See WALKER, WILLIAM; JAMESON, LEANDER STARR.



FILL'MORE, MILLARD (1800-1874), thirteenth President of the United States and the second Vice-President to succeed to that high office through the death of the President. He was therefore one of the so-called "accidental Presidents." When Fillmore was nominated for the Vice-Presidency he was known as a prominent Buffalo lawyer; he had served with distinction in the House of Representatives, and he was one of the Whig leaders in New York state. No one, least of all he himself, claimed that he was a brilliant lawyer or statesman. He was hard-working and conscientious, always doing his duty as he saw it and asking no particular credit therefor. This temperament has laid him open to the charge of being uninteresting. He was never spectacular or erratic; he was, in fact, the type of man who makes an excellent executive, but only rises to fame by accident.

Even his enemies admitted his modesty and sincerity, but a simple act, the signing of the Fugitive Slave Law of 1850, cost him his popularity. He had the peculiar faculty of detaching himself from the burning issues of the day, and of viewing them in calmness and without passion. In a sense, therefore, it is true that he had little to do with the important events of his administration, but it must not be forgotten that he did impress his personality on the men with whom he came into contact. Men like Clay and Webster were great admirers of Fillmore, and Clay on his deathbed recommended the nomination of Fillmore in 1852 for the next Presidential term.

Early Hardships. The casual observer who watched Fillmore grow to manhood would scarcely have suspected that here was a boy who was destined to be President of the United States at one of the most critical periods in

its history. At the time of his birth, on February 7, 1800, his father and mother were living on a little clearing in Cayuga County, N. Y., within the limits of the present village of Summer Hill. Through some flaw in the title the father lost his farm, and was obliged to lease an uncleared tract of poorer land some miles distant. On this new farm Millard worked until he was fourteen. He helped to clear off the timber, and in many ways did the work of a man. As the poverty of the family seemed to prohibit a professional career, the boy was apprenticed to a maker of carding wool and cloth. He was the youngest apprentice in the shop and was so brutally treated that on one occasion he threatened his employer with an ax. In the next year he found a new master, with whom he stayed four years. In 1819, when he still had two years of his apprenticeship to serve, he bought his release for $30 and made his way to Buffalo.

Up to that time young Fillmore had acquired practically no education. He had attended school occasionally for a month or two at a time, but in the intervals nearly forgot what he had learned. His father owned only two books, the Bible and a book of hymns, and young Fillmore himself did not buy his first book, a small English dictionary, until he was nearly nineteen. In spite of this lack of early training he determined to study law. He arranged with a retired lawyer to give his services in the law-office in return for his board and a chance to study. He earned a little money, too, by teaching school and by working in spare time in the Buffalo post office. In 1823, although he had not yet completed the usual course of study, he was admitted to the bar. His practice grew slowly, but in time his ability was recognized, and in the late "thirties" and the "forties" there was hardly an important case in Western New York in which he was not engaged.

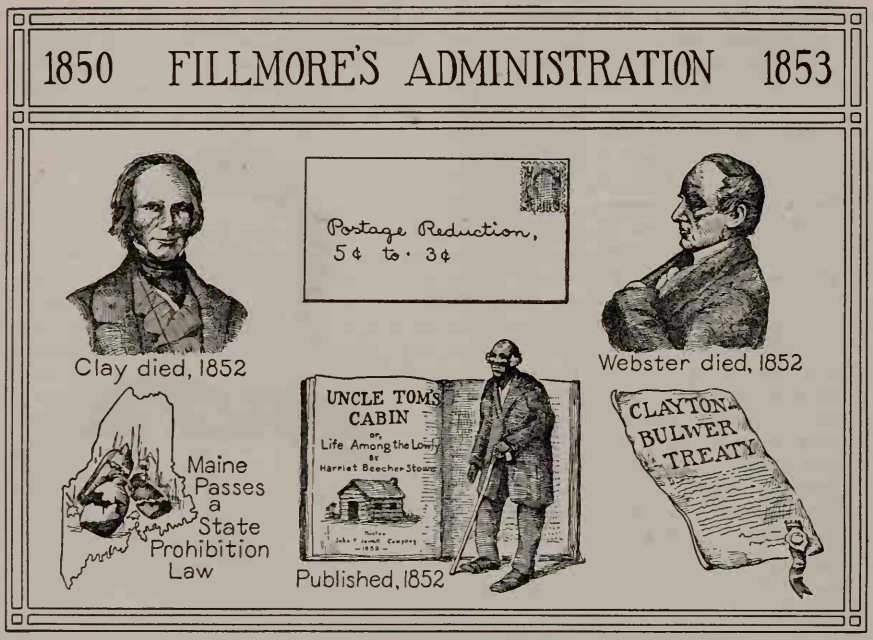
Political Career. Fillmore's political career began with the birth of the Whig party, and came to an end when that party disintegrated (see WHIG). Fillmore was always a Whig at heart; he believed in the necessity of compromise, and when the time for compromise passed he could no longer lead. He was elected to his first public office, that of representative in the New York legislature, in 1828, and served three terms, during which he distinguished himself chiefly by securing the passage of a law abolishing punishment for debt in New York.

He then served in the national House of Representatives from 1833 to 1835 and again from 1837 to 1843, when he declined renomination. In Congress he was one of the leaders of the opposition to Jackson and Van Buren,

MILLARD FILLMORE

and during his last term, when the Whigs were in the majority, was chairman of the Committee on Ways and Means, which then not only raised money but made the appropriations. Fillmore opposed the annexation of Texas as slave territory, advocated a protective tariff and internal improvements, desired Federal prohibition of the slave trade between the states, and forced the total abolition of slavery in the District of Columbia. Perhaps his most important work in Congress was connected with the tariff law of 1842, of which, as chairman of the Ways and Means Committee, he was the chief author (see TARIFF). He retired from Congress in 1843, was the unsuccessful Whig nominee for governor of New York in 1844, and in 1847 was elected comptroller of the state. A year later he was nominated for the Vice-Presidency by the Whigs, General Zachary Taylor being the candidate for President, and was elected. For details of the election, see TAYLOR, ZACHARY.

Fillmore's return to Washington as Vice-President occurred at a time when Congress was in the midst of a heated controversy involving the extension of slavery. He speedily reversed the precedent set in 1826 by Calhoun, who stated that the Vice-President had no right to call Senators to order for breach of



decorum. Fillmore, however, with the Senate's approval, kept strict order and presided with notable impartiality. During all the exciting sessions in which Clay's compromise measures were discussed he presided with such fairness that nobody on the floor of the Senate had knowledge of Fillmore's personal opinion. While the discussion of Clay's proposals (see COMPROMISE OF 1850) was at its height, the sudden death of President Taylor, on July 9, 1850, called Fillmore to the highest office in the United States.

Administration of Fillmore (1850-1853). Immediately after Taylor's death his Cabinet resigned, and was replaced by Daniel Webster as Secretary of State, Thomas Corwin as Secretary of the Treasury, and others chosen by Fillmore. Webster, while he lived, added much strength to the administration; he died in 1852, and was succeeded by Edward Everett. Webster was the last of the great triumvirate who played the chief parts in American history for over thirty years; Clay died only a few months earlier, and Calhoun had passed away in March, 1850. Each of these men made his last great speech in favor of the Compromise of 1850, though Calhoun was so ill that his speech was read to Congress by a friend. Fillmore promptly signed the various bills which were included in the Compromise, but his signature on the Fugitive Slave Law lost him the support of the Northern Whigs. Of his honest belief, however, that the Compromise was the only way to preserve the Union, there never was doubt. The publication of *Uncle Tom's Cabin* in 1852 did much to crystallize anti-slavery sentiment in the North.

Besides the Compromise of 1850 the important events of Fillmore's administration were few. Fillmore was opposed to the agitation for the annexation of Cuba to the United States, and in 1851 attempted to prevent a filibustering expedition to that island. The Whigs were in the minority in both houses of Congress, and most of the laws which Fillmore suggested failed to meet approval from the legislators. The Senate, nevertheless, approved the treaty with Japan which was the result of Perry's expedition (see PERRY, MATTHEW C.). Fillmore laid the cornerstone for the addition to the Capitol building and also secured a reduction in the rates of postage. In foreign relations Fillmore pursued the policy of non-intervention, although Webster, his Secretary of State, was instrumental in securing freedom for Louis Kossuth, the Hungarian patriot. Other events of more than local interest were

Outline and Questions on Millard Fillmore

Outline

I. Years of Preparation

(1) Birth and parentage
(2) Lack of schooling
(3) Years of apprenticeship
(4) Law study
(5) Rise in legal profession

II. Early Political Career

(1) In New York legislature
(2) In national House of Representatives
  (a) Chairman of Committee on Ways and Means
  (b) Part in slavery struggle
  (c) Tariff of 1842
(3) Comptroller of New York
(4) Election to Vice-Presidency
  (a) Fairness and impartiality in Senate
  (b) Death of Taylor

III. Administration

(1) Government affairs
  (a) Compromise of 1850
  (b) Aid for Kossuth
  (c) Reduction of postage rates
  (d) Perry's expedition to Japan
  (e) Effects of Fugitive Slave Law
(2) Internal and local affairs
  (a) "Underground railway"
  (b) *Uncle Tom's Cabin*
    1. Effect in crystallizing anti-slavery sentiment
  (c) Prohibition in Maine
  (d) Visit of Kossuth
  (e) Deaths of Clay and Webster
  (f) Pacific railways begun
(3) Election of 1852
  (a) Candidates
  (b) The issue
  (c) The result
    1. Small electoral vote secured by Fillmore

IV. Summary

(1) Retirement and death
(2) Character

Questions

What other Presidents did Fillmore resemble in the circumstances attending his boyhood days?

What was Fillmore's chief work as chairman of the Ways and Means Committee of Congress?

What would it have cost at the beginning of this administration to send a letter from New York to Boston? At the end?

What act of Fillmore's lost him his popularity and possible reëlection? What was his motive in performing it?

What did the President believe would be the most satisfactory method of dealing with the negro question?

How did a book published during this administration play a very real part in the history of the country?

Why is Fillmore called an "accidental President? To what other Presidents does the name apply?

How many books was young Millard familiar with in his boyhood? What was the first book he ever purchased?

How did he in his position as presiding officer of the Senate reverse the policy of his predecessors?

the passage of the first prohibition law by Maine in 1851; the beginning of the construction of Pacific railways, and reduction of letter postage from five cents to three cents.

In Retirement. In 1852 Webster and General Winfield Scott were both candidates for the Whig nomination for President, and Fillmore was anxious for a renomination. Scott was chosen, but was defeated in the election by Franklin Pierce, the Democratic candidate, who thus became Fillmore's successor. Fillmore was nominated for President in 1856 both by the Whigs and by the Know-Nothings, or American party. Though he received nearly 900,000 votes, compared to 1,300,000 for Fremont and 1,800,000 for Buchanan, he carried only one state, Maryland, which gave him eight electoral votes.

During the rest of his life he continued to take an active interest, but no part, in politics. For twenty years he occupied a unique position in Buffalo, his home city, of which he was the most distinguished citizen. His death occurred unexpectedly on March 8, 1874, and he was buried in Forest Lawn Cemetery. W.F.Z.

FIL'TER, a device containing a porous substance for straining solid particles or impurities from a liquid. The material for filtering may be paper, cloth, charcoal, unglazed porcelain or other similar media. The name is derived from the Latin *filtrum,* meaning *felt,* which was the material first used for the purpose. Previous to the nineteenth century if a filter made water clear that was all that was required, but modern sanitary science discovered that some filters did not remove germs and bacteria, and more efficient means were resorted to in order to purify water for domestic purposes. The filters now in general use are cases filled with charcoal, sand, powdered glass or coal cinders. Charcoal, in particular, is an excellent filter, as it absorbs noxious gases. Impure water enters at the top of this device and flows slowly through the purifying substance, which absorbs the objectionable matter. A home-made filter may be as effective as one that can be purchased.

All water for drinking purposes, except from deep wells where drainage is perfect, or from springs, should be filtered. The best method in cities is to have a filter attached to the pipes of the house supply so as to insure filtered water running from all the faucets. In the absence of filters, if the water is thought to be infected, it should be boiled, allowed to cool in an open vessel and frequently stirred

The latter process restores part of the oxygen which was lost through the process of sterilization. The water supply systems of cities frequently have filters acres in extent, having the bottom filled with sand and charcoal through which the water percolates and becomes purified before reaching the consumer.

FINCH, a general name broadly applied to that largest family of birds, the seed eaters, to which about one-seventh of all the birds belong. Many of them are beautiful songsters. Though most of the species are sober in coloring, some are very brilliant; and there is a wide range of variation. The chief distinguishing feature of all individuals of this family is the sharply-pointed, conical bill, made strong for the crushing of seeds and hard objects. There are about 550 species, and they are found in all parts of the world except Australia. In the United States and Canada they are especially abundant, and are represented by the twittering sparrow, the sweet singing canary, and by the chaffinch, goldfinch, bullfinch, bunting, crossbill, grosbeak, linnet, snowbird and numerous others. See the article BIRD for lists of birds described in these volumes.

FINDLAY, OHIO, the county seat of Hancock County, a city known for its extensive yield of natural gas, is situated in the northwestern part of the state, on the Blanchard River. Toledo is fifty miles north, Sandusky is fifty-nine miles northeast, and Columbus is eighty-eight miles southeast. Five lines of railways enter the city—the Cincinnati, Hamilton & Dayton; the Cleveland, Cincinnati, Chicago & Saint Louis; the Lake Erie & Western; the Toledo & Ohio Central, and the Findlay, Fort Wayne & Western. Three interurban lines connect with cities north, east and south. In 1916 the population was 14,858. The area of the city is a little less than eight square miles.

Findlay is located in the great natural gas and oil fields of Ohio, and the surrounding country is rich in agricultural products. Rich beds of clay and large deposits of gravel, sand and building stone are also found in the vicinity. Important among the manufacturing establishments are those producing brick and tile, boilers, pottery, automobiles, traction ditchers, gloves, beet sugar, electric insulators, shoes, furniture and carriages. There are also machine shops and foundries, bridge works, lime kilns and sugar and oil refineries. The buildings of note are a $50,000 Federal building, erected in 1905, an Elks' Home, and two public school buildings, erected in 1915 and 1916 at a cost of $300,000. The city has a business school, a library and Findlay College (Church of God), the latter opened in 1886.

The city was first settled in 1813 and was incorporated in 1837. It was named in honor of Colonel James Findlay, who built a fort here in 1812, and who served during the War of 1812 under General Hull.

FINE, a punishment imposed by judicial authority on a person convicted of a misdemeanor or a more serious crime. In case of a misdemeanor the amount of the fine is usually left to the judgment of the court, but the penalty for greater offenses is imposed by statute, which names maximum amounts which may be assessed. In case a convicted person is unable to provide the amount of fine imposed he must suffer imprisonment for such time as the court may direct. An accused person also has the right to appeal to a higher court if he is fined an amount which he thinks is excessive, as too heavy or extreme fines are forbidden by the Constitution of the United States (Amendment VIII), which declares, "Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted." See MISDEMEANOR.

FINE ARTS, the arts of man which minister not to his material necessities or convenience but to his love of harmony and beauty. Architecture, sculpture, painting, music and poetry are generally considered the five principal, or greater, fine arts.

Poetry is the most complex of all the fine arts in its resources, because it utilizes all the other arts and all the phenomena of nature and experiences of life. Music is the purest of the fine arts, because the sources of pleasure in it are purely artistic; it tells no story, represents no fact, but simply gratifies the sense of rhythm and harmony and so gives pleasure. In the modern use of the term the fine arts are only the imitative arts, which appeal to us through the eye—and the term, therefore, is often restricted to painting and sculpture. That the interest of Americans and Canadians in the fine arts is growing is evidenced by the increasing numbers of people always to be found in the art galleries and at musicales.

To Hegel, the famous German philosopher, architecture was the symbolic art appropriate to ages of obscure and struggling ideas. Sculpture was the classical art appropriate to ages of clear and self-possessed ideas, and char-

acteristic of the Greek and Roman periods. Painting, music and poetry were the romantic arts, appropriate to ages of complicated and overmastering ideas, and characteristic of modern humanity in general.

Related Subjects. The reader is referred to the following articles in these volumes:

Architecture	Painting
Arts and Crafts	Poetry
Music	Sculpture

FIN'GAL'S CAVE, an interesting natural grotto in the island of Staffa, seven miles west of Mull, Scotland, which is supposed to have been hollowed out by the action of the waves on volcanic deposits of lava. It is formed of

ENTRANCE TO FINGAL'S CAVE

basaltic columns, extends 227 feet inward, and its entrance arch is 66 feet high. It is considered one of the most picturesque natural formations in the world, and is believed to have been named after Fingal, a legendary Gaelic hero.

FINGER PRINT IDENTIFICATION. In the art of identification of criminals sure methods have long been sought. The Bertillon System (which see) is not absolutely perfect, as there is a chance of error which may lead

FINGER PRINTS

At left, double, or twinned loops; in center, a whorl; at right, simple loop. In all the world there are no other thumb impressions which will register exactly the same forms as the above.

to the punishment of the innocent. The measurements which formed the basis of the Bertillon method have been supplemented by finger prints in such a way that a record may be kept which renders it difficult for a criminal, once his finger print has been taken, to escape later identification, if captured.

The use of finger prints was common among Eastern nations several centuries before the Christian Era. The lines on the fingers and thumb vary in different individuals, but these lines on any one individual do not change in their general pattern during lifetime, and once recorded, can always be compared with fresh impressions. It is believed to-day that no two finger prints are exactly alike. In making a record for preservation the impression, or finger print, is taken by placing the fingers or thumbs on a sheet of glass covered with India ink. The fingers are then pressed upon white paper. If a criminal leaves a finger print on glass, or any other smooth surface on which the heat and natural moisture of the hand would cause such impression, it may be photographed and compared with those on record. Finger print identification is now largely relied on by the police of all countries.

FINIAL, *fin'i al,* in architecture, from the Latin *finis,* meaning *end,* is a finishing ornament at the top of pinnacles, spires, gables or other pointed structures. Finials are found in Greek architecture and are still extensively employed. In ecclesiastical architecture an elaborate finial of metal work surmounted by a cross is commonly used. In Mohammedan countries it forms a foundation for the crescent. Finials reached their most artistic stage in the latter part of the twelfth century. Many old English churches contain splendid examples in the decorations of the ends of pews.

FIN'LAND, formerly a northwestern province of Russia, called by its own people "the land of lakes and fens." With good reason is it thus named, for over eleven per cent of its surface is covered with lakes, and an even larger proportion with bog and marsh. It has Norwegian Lapland on the north, Russia proper on the east, the Gulf of Finland on the south, and the Gulf of Bothnia and Sweden on the west. Within its borders is included a large part of Russian Lapland, and its total area is 144,255 square miles, almost that of the state of Montana.

The People. The population, which is increasing steadily and in 1911 numbered 3,154,284, is largely made up of Finns, although about twelve per cent are Swedes, and there are a few Russians and Lapps. The Finns are a strong, well-built people, distinguished by

their round heads, low foreheads, fair hair and blue eyes. There is in their appearance something akin to the Mongolians, to whom they are racially related, for their features are rather flat, their cheek bones prominent and their eyes set somewhat obliquely. Mentally and morally they are well advanced and show a keen interest in education. Over ninety per cent of the adult population, it is estimated can read and write, and ninety-seven per cent of the children of school age receive regular instruction. While they are a clean, moral people, devoted to the Lutheran religion, the Finns have nevertheless, until recent years, suffered from a fondness for strong drink, but temperance principles have made great headway. Particularly noteworthy is their love for freedom; they never have been forced to submit to the system of serfdom which is the curse of other parts of Russia. All things considered, Finland was the freest part of the Russian Empire under the czars.

The Finns speak a language which is related to those of the Lapps and the Hungarians —a beautiful, flexible tongue, so highly developed that it can express the finest shades of meaning. There are various works written in it, some old and some modern, but the greatest of these is the *Kalevala*, the famous folk epic from which Longfellow took the meter for his *Hiawatha*.

The Country. This "Land of the Thousand Lakes" is for the most part a low-lying country, which ages and ages ago lay under the great sheet of ice that covered all Northern Europe (see GLACIAL PERIOD). Here and there hills and mountains rise as high as 4,000 feet above the sea, and all of these but the tallest show the rounding, smoothing effect of the glacial ice-sheet. The low coast is deeply indented, and the thousands of little rocky islands with which the shores are studded make navigation difficult and dangerous. It was the ancient glaciers which carved the beds for the labyrinth of lakes, many of which are of considerable size. The largest of them, except Lake Ladoga, of which only the northern part belongs to Finland, is Saima, which has an outlet into Ladoga over the Imatra Falls, the finest and most beautiful rapids in Europe.

A very large part of the land surface is covered with forests, and only about three per cent is available for agriculture. The soil on this cultivable area is fertile, however, and during the short, hot summers produces large crops of wheat, rye, oats and potatoes. There is an abundance of pasture land, so the dairy industry is of importance, but much of the foodstuff of Finland must be imported. Iron ore, copper and granite are the only mineral products worthy of mention; and manufacturing, despite the enormous motive-power latent in the rapid streams, has had no great development. Flour-mill products, lumber and timber products and textiles are the chief manufactures.

LOCATION MAP

History and Government. The Finns, or, as they call themselves, the Suomi, lived as independent tribes up to the twelfth century, when the Swedes began campaigns which resulted a century later in the establishment of Swedish domination. Christianity was introduced, and when Sweden became Lutheran the new faith was passed on to Finland. Russia had long cast envious eyes on this Swedish possession which was so close to the Russian borders, and more than once waged war for it, but not until 1809 was the grand duchy actually conquered from the Swedes. Every czar of Russia since then took a solemn pledge to preserve the laws and liberties of Finland, and in the main the pledge was well kept until 1897, when the Russification of the country was begun. Much in this direction was accomplished, but in 1905 a popular rising occurred in Helsingfors, the Finnish capital, which for a time secured the

old home-rule privileges. These, however, were very decidedly lessened by a law of 1910 which gives into the hands of the Russian Duma all matters which affect Russia and Finland together.

In 1918, after the Russian bolsheviki government announced the policy of "self determination of peoples," Finland demanded independence, to which the Russian government acceded without protest. Thereupon Germany and Finland signed a peace treaty, by terms of which the latter agreed not to cede territory or to grant territorial rights without German consent. A German prince was suggested for the first Finnish king by the provisional government of the country.

Gulf of Finland. This is a great eastward-stretching arm of the Baltic which juts into the western borders of Russia, having Finland on the north and the Russian governments of Petrograd and Esthonia on the east and south. It has a length of more than 250 miles, and a breadth that varies from ten to eighty miles, the central portion being the widest. Into it empty the waters from lakes Ladoga and Onega, but so steady is the outward flow that the gulf is only slightly salt. Comparatively shallow, dotted, especially along its northern shores, with rocky islands, and in the winter choked with ice, it offers difficulties to navigation, yet there are several ports on its coasts, of which the most important are Helsingfors, Viborg and Kronstadt. E.D.F.

FINSEN, Niels Ryberg (1861-1904), a Danish physician and scientist, the discoverer of the method of curing deep-seated skin diseases, like lupus, with rays of light. He was born in Strömö, in the Faroe Islands, studied medicine at Reykjavik and Copenhagen, and became demonstrator of anatomy in the university in the latter city. His experiments began in an attic room of the surgical academy in Copenhagen. In 1893 he published an article on *The Influence of Light on the Skin* which attracted immediate attention. After patient research he asserted that smallpox victims could be cured without scars by filtering the light of the room through red glass.

To develop the positive element of the light cure he employed either the light of the sun or that of an electric arc lamp of 40,000 candle power, known as a high-power Finsen lamp. Financial support was given him by the Danish government to establish a Medical Light Institute at Rosenvaenget, near Copenhagen, and there many cases have been cured which were considered hopeless. Professor Finsen received the Nobel medical prize in 1903. When he died nearly every European ruler was represented at his funeral, and leading scientists paid him high honors. His system of treatment is used by physicians for the cure of eczema, acne, tuberculous glands and kindred ailments.

FIORD, or **FJORD,** *fyord,* a long, narrow, irregularly-shaped inlet of the sea. The term is of Scandinavian origin, and applies especially to the remarkable indentations on the coast of Norway. They seem to have been made

FIORDS IN TWO CONTINENTS
Only in Scandinavia is the name *fiord* applied to these indentations of shore lines.

by glaciers long, long ago. Norway's fiords are a source of joy and wonder to tourists, bordered as they are with steep, rocky walls, with here a thickly-wooded spot, there a foaming cascade tumbling down, and perhaps down below, edging it all, a stretch of fine, fertile country.

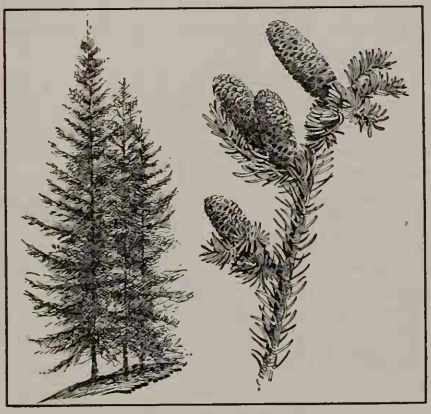
Similar inlets of the sea are found in Maine, British Columbia and Southern Alaska. Such inlets on the coast of the British Isles are known as *sea locks* and *firths.* The scenery of the fiords of the southwest coast of the South Islands of New Zealand is very imposing.

FIR, a handsome, cone-bearing evergreen tree, closely related to the pine and resembling the spruce. The fir tree is cone-shaped, and in young specimens the lowest branches touch the ground. The leaves, or needles, are flat, dark green above and light green below, growing in rows on opposite sides of the branches.

There are a number of species of fir found in cold climates and in many high altitudes throughout the eastern and western hemispheres. In America, from Hudson Bay to Virginia and westward to the Great Lakes and Minnesota, the short-lived *balsam fir,* growing to a height of about thirty feet, is common. The branches furnish a favorite bedding for campers. Its bark furnishes oil used in medicine to heal and soothe, and specially prepared *Canada balsam* (which see) is used for mounting microscopic specimens. The fresh, fra-

grant leaves are used to stuff pillows; the odor is very soothing to invalids.

The *silver,* or *lowland,* fir is a gigantic tree, often growing as high as 300 feet. It is abundant in the Pacific states and furnishes



THE BALSAM FIR
Form of the tree and a branch showing needles and cones.

a soft, white wood that is used for boxes, barrels and some interior finishing. The *red fir* of the same region is very much like the silver fir. About 2,000,000 board feet of fir timber, worth from $18,000,000 to $20,000,000, are cut yearly on the Pacific coast.

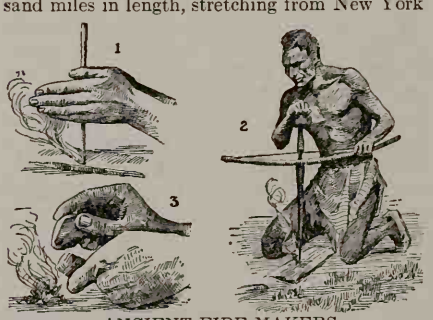
FIRE. Fire is visible heat, resulting from the chemical combination of certain substances with the oxygen of the air. Heat and light are among the results of this union. Although they are perfectly combustible, such substances as wood and coal will not take fire of themselves; that is, they will not combine with oxygen until they are heated, and they will not continue to burn if oxygen be not present. This explains the ease with which a small fire may be smothered under a quilt; it dies when it can no longer feed upon oxygen.

Wood gives the liveliest sort of blaze. This is due to the fact that when wood is heated it gives off quantities of inflammable gas; the resulting flame is simply burning, or uniting, gas. Flames give light for several reasons. Some gases are highly luminous in themselves, but in the case of such flames as those formed by gas jets, the light is given out by particles of unburnt carbon which are raised to incandescence.

The value of fire to civilization can hardly be exaggerated. It cooks the world's foods, warms people in winter and furnishes the energy that drives all the great machines and makes vast industries possible. In fact, fire is so nearly indispensable to life itself that no tribes of men are known who have not the art of making fire, and according to the modern theory it was the discovery of fire and its uses that marked the emergence of man from the lowest condition of savagery (see CIVILIZATION). Primitive peoples have, however, very slow and unsatisfactory ways of kindling flames. One of the earliest ways was that shown in the accompanying illustration, in which a sharp stick rotated between the hands produced heat and then fire.

When fire was so difficult to kindle, it is no wonder that primitive man took care to keep some fire burning all the time. The reason for this practice was later forgotten; nevertheless, fire was still regarded as precious and often as a symbol of sacred things, which explains the reason that fires were kept burning in the temples. Early thinkers of the pagan world developed the mistaken idea that fire is one of the four elements of the world, the other three being air, earth and water. Science has shown that this is not true.

Fire Prevention. The enormous loss in property and lives caused by fires each year can be graphically brought home to everyone by the following illustration: Imagine a street a thousand miles in length, stretching from New York



ANCIENT FIRE MAKERS
(1) A sharp stick rotated swiftly between the hands, friction producing heat, then fire, the most primitive method; led to (2) in which the genius of mechanics is shown. The cord encircles the upright stick and one single length of the cord turning around the stick causes many vibrations of the latter. (3) A great step toward matches; man discovered that striking a stone on a flint produced a spark which ignited dry grass.

to Chicago and lined with buildings of a typical city—homes, churches, schools, factories, stores, etc. Suppose this street, crowded with people and vehicles of every description, should be set on fire at either end, and should burn at

the rate of three miles a day. At the end of a year every building from one end of the highway to the other would be destroyed, and the spectator walking down the scene of desolation would come upon an injured person every thousand feet and a human corpse every half mile.

The ruin pictured in this supposed case is reproduced every year in the United States, where, in 1915, the damage from fire amounted to $184,989,100. The loss in that year was the smallest since 1905. In 1914 the damage amounted to $235,590,000. Besides the loss in property, about 5,000 persons are killed and about 50,000 persons are injured by fire each year. It has been shown that nearly seventy-five per cent of these fires are due to preventable causes. Statistics show that the fire losses in the United States and Canada from 1877 to the end of 1915 amounted to the tremendous sum of $6,049,817,000, or an average loss of $155,122,000 a year. It is in order to prevent this enormous waste that a campaign for fire prevention has been started in recent years, an important element in which is the education of the people to the losses caused by fires and to the means of preventing them.

Causes and Means of Prevention. The loss caused by fire averages about $2.50 a year per head of population in the United States and Canada, while in Europe as a whole it averages only $0.33. The great fire waste in the United States and Canada as compared with European countries is due to a number of causes. In Europe buildings are usually of brick or stone, while in the United States and Canada, where the growth of the cities has been so rapid, the chief material has been wood. The building regulations, too, are more stringent and more rigorously enforced in Europe than on the other side of the Atlantic. In Europe, either in the country or the city, a heap of paper or rubbish is seldom seen, even in the poorest neighborhoods, for the person responsible for its existence is liable to a severe fine. Again, almost every clump of trees worthy the name of forest is either privately owned or is under state protection. Lumbermen and campers are required to exercise the greatest caution in building fires and removing debris.

Another and perhaps more important factor has been that intangible element, the national temperament of the American people. Americans are inclined to be careless and wasteful. The average American has a feeling that anything destroyed can be easily replaced. The average European, on the contrary, who has long felt the pressure of economic forces, and has been made to realize not merely by law but by bitter experience that waste is harmful, has a far better understanding of his duty to prevent needless losses. As a result of a far-reaching campaign of education the American people are beginning to exercise better care, both in factories and in homes, and to show a greater readiness to comply with the precautionary measures against the outbreak of fires. Other measures have been the adoption by many states, provinces and cities of laws and regulations for better and safer buildings, as well as better inspection and increased supervision of buildings by members of the fire department.

Comparison of Fire Losses. The annual losses by fire per head of population average about $2.40 in the United States; $2.75 in Canada; $0.50 in England; $0.65 in France; $0.20 in Germany; $0.15 in Switzerland; and $0.10 in The Netherlands. The losses by fire per head of population in a number of American cities in 1915 were: New York, $1.44; Chicago, $2.46; Philadelphia, $1.68; Boston, $4.06; Pittsburgh, $3.10; Washington, $2.21; and Cincinnati, $1.74. In Canada these losses were: Halifax, $6.73; Vancouver, $5.47; London, $3.62; Hamilton, $3.08; and Winnipeg, $2.34. In some European cities they were: London, $0.60; Birmingham, $1.25; Birkenhead, $1.13; Cardiff, $0.55; Leeds, $0.84; Sheffield, $0.23; Belfast, $0.46; Dublin, $0.22; Paris, $0.61; Bordeaux, $0.61; Marseilles, $0.79; Frankfurt, $0.16; Milan, $0.48; Florence, $0.17; Basle, $0.19; The Hague, $0.07. See FIRE DEPARTMENT. T.R.W.

FIRE'ARMS, a term generally applied to all weapons which are discharged by gunpowder or other explosive. Although they are supposed to have originated in the East and to have been used by the Chinese 2,000 years before the birth of Christ, firearms as we know them date from soon after the invention of gunpowder, in the thirteenth century. The first firearm was undoubtedly a cannon, and it was probably some time before it was discovered that such a terrible explosive could be used in small weapons held in the hand. The effect of even the first crude cannon used in warfare was so terrible that a complete change of military tactics was necessary. Armor was of no further use; knight and man-at-arms were made equal on the battlefield; the castles that had easily withstood the attacks of men

armed with battle axes, spears and bows and arrows crumbled before the assault of the new weapons. Cumbersome pistols, blunderbusses and clumsy muskets were introduced, and the bow and arrow was driven from the field, to be retained only by savages. The rifle was invented in 1498 and since that date multiplied improvements have been made, resulting in the high-powered firearms and explosives of modern warfare.

Related Subjects. The reader is referred to the following articles in these volumes:

Armor	Musket
Arms	Revolver
Artillery	Rifle
Cannon	Shotgun
Machine Gun	Small Arms

FIRE'BALL, a projectile discharged from a gun with the purpose of setting fire to the enemy's works, or by bursting in the air, to illuminate positions beneath and act as a guide to gunfire. During the War of the Nations fireballs were extensively used for the first time in centuries, for since medieval times no nation at war had employed them. The modern fireballs consist of bags filled with a mixture of powder similar to that employed in the making of fireworks. When discharged into the air they become ignited by means of fuses and burn slowly with a bright light, like that given out by the balls in a Roman candle. The name fireball is also given to a meteor which appears like a globe of light passing with great velocity across the sky.

FIRE'CRACKERS, a term applied to several kinds of fireworks resembling small bombs. They are made of cylinders of paper of many layers, in which an explosive charge of gunpowder is placed. A fuse, made of cotton soaked in a mixture of starch and gunpowder, projects from one end. Firecrackers may be made to explode once, or may consist of a long cylinder, tightly tied at intervals, with many charges giving a series of a dozen or more explosions. They vary in size from one-fourth of an inch in diameter and one inch in length, to three inches or more in thickness and more than one foot in length. The explosive is a mixture of powdered charcoal and chlorate and bichromate of potash.

The origin of firecrackers is unknown, but they were probably used by Eastern peoples several thousands of years ago. Their manufacture was begun in America in the middle of the nineteenth century. They were for years produced in enormous quantities, but the output is decreasing, owing to legislation limiting their use. There is widespread agitation for their entire suppression, as they are dangerous to handle, and their careless use often leads to serious injury. The Fourth of July is the most popular occasion for their use in the United States; in many parts of the world they are a feature attending Christmas celebrations. The Guy Fawkes celebrations of November 5 were formerly the chief occasions for the use of firecrackers in England and Canada. See FIREWORKS.

FIRE DAMP, a miners' name for carbureted hydrogen, or coal gas, found deep in mines and caused by the decomposition of coal. When mixed with air it becomes highly explosive, and has often caused great loss of life by igniting when accidentally brought in contact with the flame of a lamp or candle. A dangerous gas, called by miners "after damp," is produced by the combustion of the fire damp. Accidents due to fire damp were so frequent in English coal mines that Sir Humphry Davy devoted particular study to the subject, and finally invented a lamp which could be used with safety in an atmosphere saturated with fire damp. The safety lamp is now a part of the equipment of every miner, and is worn on the front of the cap. See DAVY, SIR HUMPHRY; MINING.

FIRE DEPARTMENT, a semi-military organization formed to fight conflagrations. Cities in the United States and Canada find it far more necessary to maintain fire-fighting forces than in Europe, where more attention is given to fire prevention. Until recently American fire departments concerned themselves only with extinguishing fires already burning, but now they coöperate with insurance companies in securing and enforcing stricter building laws and in spreading knowledge of the causes of fire. Wooden structures prevail in the United States and Canada, except within certain districts called "fire-limits," but in Europe they are not permitted in any locality where they may endanger other buildings.

In America the highly-trained and efficiently-equipped fire departments of to-day are the outgrowth of the "bucket brigades" which in earlier times passed pails of water from hand to hand, and the volunteer hose companies which ran to a fire pulling their hose carts and hand pumps.

The fire departments of all large cities are organized along very similar lines. Each consists of a chief fire marshal, assistant fire mar-

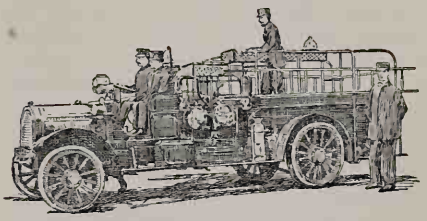
shals, battalion chiefs, captains and lieutenants, firemen (who are the "privates" of the fire-fighting force), engineers, and veterinary surgeons. Since the introduction of motor-driven apparatus, the latter are reduced in number and more of the men must be technically trained. The various companies, under command of captains and lieutenants, are stationed in widely-scattered permanent quarters, and over groups of these are the battalion chiefs and assistant marshals. From one central point the chief marshal directs all operations. In proportion to population the American and Canadian fire-fighting forces are four times as many as those of Germany and France and three times as many as those of England, yet losses in European countries, which are much more densely populated, are very slight compared to the fire waste in North America.

Fire Engines. The first successful steam fire engine was used in Cincinnati in 1850. But special fire pumps had been known since Roman times; one was described by Hero of Alexandria about 150 B. C. The business of the fire engine is to force water through the hose at a high pressure. The highest type of engine can pump 1,300 gallons a minute. Horse-drawn steam engines are being supplanted by those which are motor driven, and in some cases the pumps are operated by the gasoline motor which propels the vehicle, instead of by steam. Where cities install high pressure water mains, the fire engine becomes unnecessary. Though some pumps can throw water to the height of a twenty-story building, they are little used, as most "skyscraper" fires are fought

MOTOR FIRE ENGINE

from the inside with the apparatus which is a part of the building.

Chemical Engines and Fire Extinguishers. A fire which has not spread far is readily extinguished by carbonic acid gas or other gases. The gas is usually conveyed to the fire in water through a hose, but as much less water and a lighter hose is required than for extinguishing with water alone, the chemical engines can be built lighter, and they are more speedy than the steam engines. They reach the scene of a fire first, and often have it under



COMBINATION MOTOR VEHICLE

Comprising hose cart, hook and ladder equipment and chemical engine.

control before the rest of the department arrives. Hand fire extinguishers working on the same principle have been known since 1816; they are an English invention.

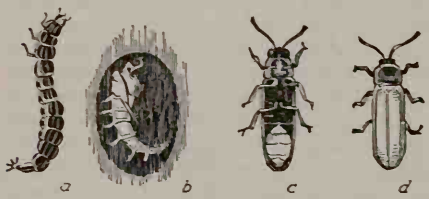
For warehouses, factories, "skyscrapers" and other large buildings, automatic sprinklers are advocated by insurance companies. These consist of pipes, within the ceilings of rooms, containing water under pressure. At intervals, sprinkler heads are attached, the openings being closed by a thin piece of metal which melts at a low temperature. Even a small fire raises the temperature, the metal softens and gives way, and the water is sprayed over the floor.

Fire Escapes. Special measures are necessary to furnish means of escape from public and semi-public buildings in case of fire. There are various crude forms of fire escapes, such as ropes, slings and baskets, by which those in a building may lower themselves to the ground. The most common fire escape, however, is an iron ladder running from top to bottom of a building, with a platform or balcony at each story which may be reached from a window. Enclosed fireproof towers with broad stairways are the best type of escape. Fire departments are equipped with ladders, which may be adjusted to various lengths, and with short *scaling* ladders. Tubes of strong sailcloth through which persons may easily slide are often provided. If all means of escape are cut off it is sometimes necessary for persons in a burning building to jump into large sheets of canvas or tarpaulin held by firemen below. The laws in most civilized countries are strict in requiring factories and public buildings to be provided with adequate fire escapes. When inspection is lax and laws

are not enforced, the world is often shocked by great loss of life in a serious fire.

Fire Alarms, for giving warning of an outbreak of fire, are usually electrical. In nearly every large city alarm boxes, usually of iron, and fitted with doors or glass windows, are placed at frequent intervals in prominent outdoor locations. To give the alarm the window is broken or the door opened, and a handle inside is pulled. An electric circuit, thus closed, rings an alarm in the main fire office and in all the stations of the district in which the fire is located. In large buildings automatic alarms are installed; in case of fire the rise in temperature closes a circuit and rings the fire station gongs. F.ST.A.

FIREFLY, the name given to several groups of beetles found in warm and tropical regions, whose distinguishing characteristic is their



THE FIREFLY

Many a night I saw the Pleiads, rising thro' the mellow shade,
Glitter like a swarm of fireflies tangled in a silver braid.
—Tennyson: *Locksley Hall.*

The illustration shows: (*a*) Larva; (*b*) pupa; (*c*) mature insect, under side; (*d*) same, viewed from above.

power to glow in the darkness like a spark of fire. The light-giving organ consists of fatty tissue supplied with numerous air tubes and nerves; the nerves stimulate the air tubes and the latter convey to the fatty tissue the oxygen which, by a process little understood, produces the light. Usually the luminous part is situated on the sides of the abdomen, and the light is greenish-white. A common American firefly, or "lightning bug," which ranges from Illinois southward, is about one-half an inch long and blackish in color, with red and yellow markings.

In many cases the larvae (young) and the eggs of the firefly are also luminous. Wingless forms also possess this property, notably the glowworm of England and the European continent, which is the wingless female of the common firefly. Another wingless form is the railway-beetle of Paraguay, a wormlike creature three inches long, which sends forth a strong, red light from both ends of its body, and a green light from points on its sides. Its name refers to the colors of the lights, which suggest railway signals.

Some of the uses to which these interesting creatures are put are worthy of mention. The luminous click beetle of the tropics, which emits a strong greenish light, is sometimes placed in a lace pocket of the Cuban lady's gown or attached to her golden chain. Spanish ladies wrap fireflies in gauze and use them as hair ornaments. The natives in tropical countries have been known to put a number of them in bottles, and to use them as lanterns. Men traveling through dense forests at night sometimes attach fireflies to their boots to illuminate the path before them. It is said, also, that certain tropical birds use these insects to light their nests.

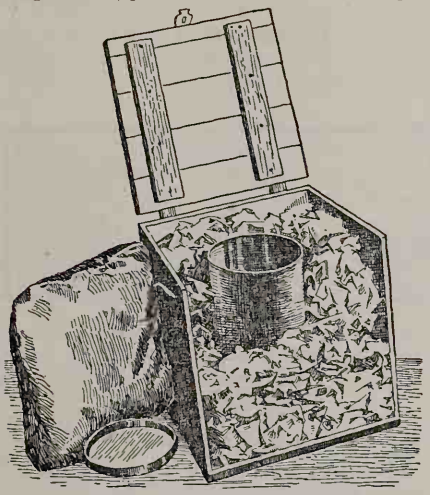
FIRE'LESS COOK'ER, a modern invention by means of which great economy of fuel, of time and of labor is effected. The cooker is based on the same principle as the thermos bottle; it has an inner containing vessel surrounded by non-conducting materials, so that heat can escape only very slowly from the substance placed in the vessel. See THERMOS BOTTLE.

The process consists of thoroughly heating or partially cooking the food and then placing it in the fireless apparatus, which keeps it hot until the cooking is completed. Many types of fireless cookers are on the market, alike in principle but different in minor detail. The non-conducting materials generally in use are mineral wool and asbestos. The fireless cooker, under the name of the "hay-box," has been used for many years by the Norwegians. Women who go to work in fields prepare the hot dish for the family supper before leaving

THE FIRELESS COOKER, AS PURCHASED

home in the morning. The supper is packed away in the "hay-box," which is exactly what its name implies, to continue the process of cooking until the family returns at night.

How to Make a Fireless Cooker. Any housewife can make a very satisfactory cooker by utilizing a few inexpensive materials. The outside container may be a wooden box with a hinged cover, provided with a hook and staple



HOME-MADE FIRELESS COOKER
Its plan of construction is explained in the text.

at the front to keep the cover down. A cylinder of strong pasteboard, placed on end, makes a very good inside container to hold the utensil in which the food is cooked. For packing, excelsior or old newspapers will be found serviceable. This material should be packed snugly around the cylinder and be brought to a level with its top, which is about four inches lower than the box lid. The intervening space should be filled in with a cushion stuffed with cotton or excelsior.

The operation of such a cooker is very simple. In the morning, for instance, a kettle of stew is placed on the stove. When it begins to boil it is taken off and the closely covered kettle is immediately transferred from the stove to the inside container. The cushion is then placed in the box, the cover shut down and fastened, and in due time the hot stew is taken out to be served. Two dishes may be cooked at the same time if a kettle containing two divisions is used; kettles made especially for such purpose are on the market. S.L.A.

FIRE'PROOFING, a name applied to various processes by which combustible materials are made fireproof, or able to resist the action of fire. Asbestos, silicate and tungstate of soda, borax and phosphate of ammonia are among the best known fire resisters. Wood thoroughly soaked in a solution of silicate of soda will withstand terrific heat before being charred. The chemical, however, affects the surface of the wood, making it impossible to finish it so well as wood not thus treated.

Asbestos is largely used for theater curtains, lining for safes and for filling in partitions to prevent the passage of heat. Dress fabrics may be made partially fireproof by a thorough soaking in a solution of sulphate of ammonia or tungstate of soda. Borax is also used for the same purpose, but it has an injurious effect and greatly weakens the fabric. No method has yet been devised for rendering combustible materials absolutely fireproof, the best processes giving only partial protection. In most large cities buildings used for public purposes are built of materials such as stone and steel, which in themselves are fireproof and need little further protecting processes.

FIRE'WORKS, various preparations and combinations of combustible materials, such as gunpowder, saltpeter, sulphur and charcoal used for the purpose of making pyrotechnic displays. It is thought their manufacture was known to the Chinese at least 5,000 years ago. Displays of fireworks were certainly given in the Roman circus, but the materials used were probably similar to Greek fire (which see).

Modern fireworks may be divided into those simple in construction, such as crackers, squibs, Roman candles and rockets, and another class of more elaborate set pieces which represent elaborate designs when burning. The simpler pieces are cylinders of paper containing a mixture of powder designed to throw various colored sparks or balls of fire into the air, sometimes with an additional charge of powder which makes a loud explosion and fiery display. Set pieces require great skill and ingenuity, and the art of firework display has reached such development that scenes representing naval and military battles and elaborate pageants may be reproduced.

In the United States alone fireworks valued at nearly $2,000,000 (wholesale price) are annually produced. The Fourth of July celebration makes the greatest demand upon fireworks manufacturers, but in the Southern states Christmas is celebrated with fireworks displays.

FIRE WORSHIP, the worship by certain primitive peoples of the god of fire, or the divine principle as typified by fire. The term is also applied to a ritual practiced by all the

early Aryan peoples in connection with the cult of the family (see ARYAN). As specifically applied to the ancient religion taught by Zoroaster and still practiced by his followers in India and Persia, the term is rather misleading. In the Zoroastrian cult, fire is employed simply as a symbol of the divine being. After death the soul was supposed to hover about its earthly abode for a period of three days. On the fourth day, *Sraosha,* the good spirit, bore it aloft, closely beset by demons, who sought to relieve him of his precious burden. Fires were then lighted by the friends of the deceased in order to embarrass the evil spirit. See ZOROASTER.

FIRST AID TO THE INJURED. See subhead, in article WOUNDS. For related topics, see ANTIDOTE.

FISH, a water-inhabiting (aquatic) animal, the lowest in the order of vertebrates, or backboned animals. It is distinguished from the higher forms of animal life in that it breathes through gills and its limbs take the form of fins. Although there are a vast number of species of fish, now estimated at about 13,000, there is more similarity among the different species than there is among the various kinds of most other animals. The majority of fish have elongated bodies, tapering at both ends to present slight resistance to the water. The general form has become modified to meet the requirements of surroundings, but not sufficiently so to alter the general type, of which the trout and salmon are good examples.

Fish have cold, red blood and are usually covered with scales growing in the skin and overlapping like the plates in suits of armor or shingles on a roof. The heart of a fish performs the same functions as does the human heart. By it the blood is pumped through the system, first being purified by passage through the gills. The backbone is loosely jointed, enabling a fish to turn and twist in a manner impossible to animals of a higher order. Most fish possess an air bladder found in no other animals, but its purpose is not clear. By some authorities it is regarded as a balance, weighting or lightening the body as required. The fins, usually in pairs, are typical of the fore and hind limbs of quadrupeds, but have not yet reached an equal stage of development.

Reproduction. Many fish are absolutely without anxiety concerning their eggs or young. The eggs are deposited in chosen localities, on rocks, weeds or at the bottom of streams and there left to hatch or be destroyed, as chance may determine. The loss of eggs and young is very great, for almost every species is the prey of larger fish; so in order to preserve the existence of species a vast number of eggs is deposited. A cod produces about 10,000,000 eggs annually, but beyond depositing them, does nothing to insure their preservation. Other fish, however, are examples of parental care and forethought. The humble stickleback builds a nest of sticks carefully plastered together with gummy excretion, and when the eggs have been deposited stands guard until the young are hatched. Bass and sunfish also guard their eggs. The salmon and the shad ascend rivers to deposit their eggs; the eel reverses this process by returning to the sea to spawn. The eggs of sea fish are hatched more quickly than those of fresh water species. In the sea the loss among the young is greater than in rivers and bodies of fresh water, as there are more species to prey on each other. Some sea fish hatch from the eggs forty-eight hours after deposit; the eggs of the brook trout require three months for hatching.

Food of Fish. Some fish are omnivorous, that is, they eat both vegetable and animal matter; others eat only vegetables, and others again confine their diet to smaller fish, of their own or other species. The appetite of most fish appears to be equal to that of the robin. In carnivorous, or flesh-eating fish, the mouth is very large and the stomach so elastic that even small fishes are able to swallow others nearly as large as themselves. Some species of fish live entirely on minute particles of matter strained from the water.

Some Interesting and Remarkable Fish. Reference has been made above to the stickle-

back, which builds a carefully plastered nest of sticks. Many other fishes build nests, including the lumpsuckers, a deep-sea fish, the chubs, and the sunfishes. The chub usually heaps up a pile of pebbles, on which the eggs are laid; then more stones are piled on top. The sunfish's nest is scarcely worthy of the name, for it is nothing more than a shallow cup scooped out in the sand; yet the sunfish will fight valiantly to defend it. Then there is the *Antennarius,* or frog fish; the male is said to pick up the eggs and blow them from his mouth, along with many bubbles of mucus. These bubbles harden and form a light, floating nest.

The variety of fishes is almost beyond comprehension. Among the 13,000 different kinds, there are tiny fishes and giants, fat ones and thin ones, round ones and triangular ones—all possible shapes, sizes and colors. From the minnow to the shark there are thousands of varieties. The man-eating sharks average thirty to thirty-five feet in length, but in the tropics there is one species which grows to a length of sixty or seventy feet. Then there is the great oarfish, twenty to twenty-two feet long and weighing over 500 pounds; though large, it is the opposite of the shark, for it is stupid and defenseless, and has a body which resembles a tough jelly in consistency and is almost transparent. Some fishes, like the great weever, are protected by poisonous spines, while others, the electric fishes, shock any living thing with which they come into contact. The electric eel of South America, for example, is powerful enough to stun a man. The swordfish and the sawfish have remarkable jaws, which they use not merely for defense but for catching food.

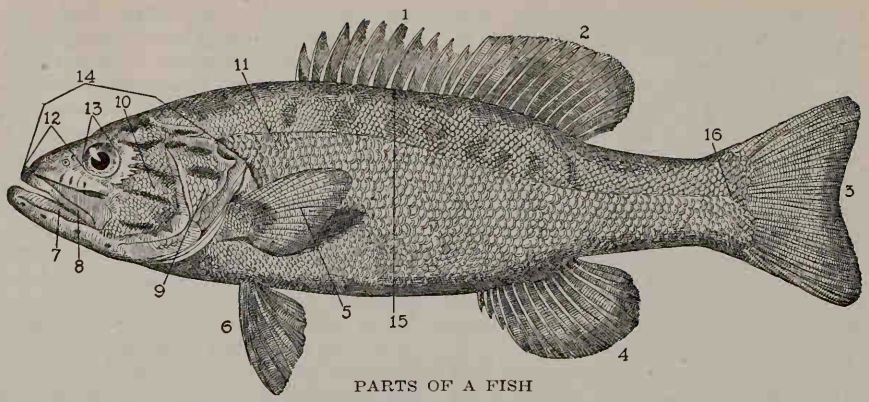
As a rule the fishes of the tropics are more brilliantly colored and show more variations than the fishes of temperate zones. For example, there are the parrot fishes of the Mediterranean Sea and the Indian Ocean; among them bright greens and reds are the predominating colors. One of the most beautiful of those is the flame-colored *scorpaena miles,* a Ceylon fish which has no English name; the Singhalese call it *ratoo gini maha,* which means *great red fire.*

Even in temperate zones there are remarkable fishes. There are the blind fishes of Mammoth Cave, Kentucky; once they had eyes, but from ages of disuse the organ of sight has decayed. There are the many varieties of flying-fishes. One of the most remarkable of all fishes is the salmon, which lives both in fresh water and in salt water. It travels anywhere from twenty to a hundred miles or more in the course of a season, and when spawning season comes ascends some river to lay eggs. It is on the rivers that the salmon perform some of their astounding feats, leaping upward ten or twelve feet, and in this way ascending a river even above falls and other obstacles. There is also the climbing-perch, which occasionally travels short distances overland, is known to climb low bushes and has even been said to climb trees.

Even the common fishes, many of which every child knows, have peculiarities which are as interesting as those of distant places. Some of them like cold water; some, like the sunfishes, prefer the water to be warm. Some, like the familiar chubs, have been known to bury themselves in mud at the beginning of winter and hibernate; others, like the pickerel, are hungry and active in winter, and can be caught with a hook and line dropped through a hole in the ice. There is scarcely a single species of fish which will not repay intelligent study.

Fish as Food. From the earliest days of history fish has formed an important part of human diet, and at the present day is eaten in every country in the world. Fresh water and salt water fish are equally wholesome, and any preference for one over the other is the result of individual taste. Fresh fish is usually eaten boiled, fried or baked. A large quantity of the annual catch of fish is preserved by being salted, dried and smoked, or canned. These processes considerably change the taste but add to the food value of the fish and deduct a large portion of waste and water.

The widespread idea that fish is more easily digested than any other meat is not correct. The digestibility of fresh fish such as cod, mackerel, bass, turbot and others of the common food fishes, is equal to that of good lean beef. Salted fish is not so easily digested, but the percentage of protein absorbed from a pound of salt fish is greater than the percentage from the same quantity of beef (see PROTEINS). Much has been written about the danger of poisoning attending the use of canned fish. Modern methods of canning and scrupulous cleanliness in all the processes of preservation have so reduced the danger of ptomaine poisoning that practically it does not exist. Care should be taken, however, to remove the contents of the can immediately



PARTS OF A FISH

1. Spinous portion of dorsal fin
2. Soft portion of dorsal fin
3. Caudal fin
4. Anal fin
5. Pectoral fin
6. Ventral fin
7. Mandible or lower jaw
8. Premaxillary
9. Opercle
10. Cheek
11. Lateral line
12. Snout
13. Eye
14. Head
15. Depth
16. End of last caudal vertebra

on opening. Canned fish should be eaten at once, as when taken from the can it does not keep well and is subject to growth of injurious, if not decidedly poisonous, organisms.

Of the various shell fish, oysters are the most easily digested and the most nutritious. Lobsters and crabs, although highly valued for their flavor, are not readily digested. It is agreed by authorities on diet that fish is not found on the table in the homes of the United States and Canada as often as its food value warrants. The average composition of fresh fish is as follows: refuse, consisting of skin and bones, 42%; water, 44%; protein, 10.5%; fat, 2.5%; mineral matter, 1%. It has a fuel value averaging 300 calories per pound (see CALORIE).

There is a widespread belief that fish is particularly valuable as a brain food, based on the presumption that fish contains more phosphorus than any meats. This, however, is not correct, as analysis shows no more phosphorus in fish than in other animal foods. Authorities agree also that even if phosphorus were present in unusual quantities that would not make fish more desirable, as phosphorus is not more essential to the brain than nitrogen, potassium and other properties of food.

Fish Culture. As the demand for fish has increased it has been found more and more necessary to increase and preserve the stock to prevent extermination. This particularly applies to inland bodies of water and to streams. Shellfish are, however, the most carefully cultivated of all sea foods. The world's supply of oysters would long ago have been exhausted had it not been for practical preservation and culture.

Fish culture has been practiced in China from ancient times. In most European countries it is now an important industry, either directly supported or encouraged by the government. In Canada there are many private establishments for the purpose of hatching, rearing and protecting fish, but the stock of inland waters has been so little drawn upon that the government has not seriously taken up the question of fish culture, except in the eastern provinces. In the United States, which leads the world in fish culture, a fish commission directly responsible to the Federal government maintains thirty-six hatcheries. Here the fishes' eggs are collected and hatched, the young fish, or "fry," being distributed among the waters most in need of restocking. The hatcheries of the United States Fish Commission handle and distribute yearly over 4,000,000,000 fish of all species. In addition to this commission, nearly every state has its commission, with hatcheries for restocking state waters. In Canada the fisheries are controlled by the Department of Marine and Fisheries.

Fishing Laws. To prevent the extermination of certain species of fish it has been found necessary from time to time to regulate and limit fishing as to time, and in some cases to the number of fish that may be taken. Sea fisheries are regulated by international laws, which have led to considerable friction in the

past. Broadly speaking, the water surrounding a country is the sole property of that country for a distance of three miles from its shores. Fishing within those limits is regulated by state or national laws. Outside those limits the sea is world property, and fishing is governed by international laws. Fishing in inland streams and small lakes is regulated by state or provincial laws. The catching of fish is prohibited at certain seasons, and in many cases fishing in state and even in privately-owned waters is restricted to those who pay for the privilege or who have obtained a license. In Canada the fishing laws vary in the different provinces, but are based on the principle of preserving the stock while permitting capture of sufficient fish to meet market demands.

Fish Products. The value of fish is by no means confined to its desirability as food. The cod, although one of the most nutritious of food fishes, furnishes a supply of oil that would warrant its capture even if it were not a food fish. Cod-liver oil is used medicinally in every part of the world. The menhaden, caught in great quantities off the shores of New England, is used as a fertilizer, and is also valued for its oil. The skin of many large fishes furnishes shagreen. From the cuttle-fish sepia is prepared, and from the dried and powdered refuse of all fish a very useful fertilizer is manufactured. G.W.

Deep-Sea Fisheries

The deep-sea fisheries of the United States have been carried on in waters adjacent to the New England states continuously for more than three hundred years. The pursuit of the mackerel and the cod, with its allied species, the haddock, hake, halibut, pollack and cusk, constitutes the deep-sea fisheries of New England. The chief ports of the industry are Boston and Gloucester, Mass. Boston ranks as the principal market for fresh fish, while Gloucester excels in salted fish and fish products. In 1915 the value of the deep-sea fisheries of New England was $4,737,917. The fishery was carried on by a fleet of 410 sails, which made a total of over 7,000 fishing trips during the season.

The codfish, with the five others of his kindred, are called ground-fish, from their habit of living at the bottom of the ocean. The fishery for ground-fish is pursued at all seasons of the year, more especially during the warmer months, except in case of the fresh haddock fishery. The principal deep-sea fishing grounds, or *banks*, in order of their importance, are the South Channel, George's Bank, Brown's Bank, the Bank of Newfoundland, the Cape Shore of Nova Scotia, and the Gulf of Saint Lawrence. George's Bank, southeast of Massachusetts, is the northeast extension of the Nantucket Shoals toward Nova Scotia; it covers an area of sea bottom greater than the area of Massachusetts. Brown's Bank lies between the George's Bank and Nova Scotia. The Grand Bank of Newfoundland is southeast of Newfoundland and has an area of 37,000 square miles, or more than that of the state of Indiana. American fishermen frequent the Grand Bank of Newfoundland principally for codfish and halibut.

Methods of Catching Ground-Fish. The ground-fish have a restricted movement over their fishing grounds during the different seasons of the year. When the fishing schooner reaches the Banks it is anchored, and there it remains as long as the fishing proves profitable; but the schooner may be anchored at several parts of the vast fishing grounds on a single trip. Deep-sea fishing for cod and the other ground-fish is pursued by means of hand lines and trawls. Formerly fishing was carried on by means of hand lines from the schooner's deck; later, the hand-line fishing was done from dories, each schooner carrying seven or eight dories, with two fishermen in each.

The ground-fishery to-day is carried on principally by means of the trawl, which consists of a stout cod line about a mile in length, to which are fastened at intervals of six feet smaller lines about three feet long, each fitted with a hook at the end. After the trawl has been baited with frozen herring or clams it is coiled in tubs until it is used. Fishing with trawls is done from dories, there being two fishermen and two trawls in each dory. The dories are rowed a mile or more from the schooner in different directions; after reaching the location where the trawl is to be set one man rows the boat while his dory-mate throws the trawl overboard. When the trawl has been set it lies on the sea bottom, or close to it. Each end of the trawl is buoyed up by a small cask, which remains at the surface to enable the fishermen to locate the trawl. After one trawl has been set the fish-

ermen row a distance away and set the second trawl. In fair weather a trawl may remain set over night; in rough weather it is pulled into the dory and taken aboard the schooner. Pulling the trawl with its catch of fish from off the ocean bottom into the dory is called "under-running" the trawl.

Methods of Catching Mackerel. The methods employed in mackerel fishing differ entirely from those in cod and halibut fishery, as the habits of the fish differ. Mackerel roam over large areas of the sea in a season, while the ground-fish remain near their respective feeding-grounds. Mackerel are caught at the surface of the water; the ground-fish are caught near the bottom of the sea. Mackerel fishing is pursued from April until November, while the ground-fishing is carried on at all seasons of the year. Mackerel are taken along the Atlantic coast from the Virginia capes to Anticosti Island, in the Gulf of the Saint Lawrence. The ground-fish are taken principally on the fishing grounds of New England waters and of the maritime provinces of Canada. Like birds of passage, mackerel migrate from the southern to the northern waters every year. They are first discovered by fishermen off the capes of Virginia in early April. Every spring they spawn in the shallow waters of the New England shores and the Gulf of Saint Lawrence; in the late fall months they gather in large schools and journey southward again. It is a mystery where they live during the winter months.

Formerly mackerel were taken by means of a mackerel-jig, or hook, the fishing being done by single lines from the schooner's deck. Every mackerel schooner now has one or two seine-boats which are used when the setting of the seine is made. Mackerel seines are large nets about 125 feet deep and one-quarter of a mile in length. The seining fleets reach the southern fishing-grounds near the first of April. They follow the mackerel northward as they advance toward New England.

By the middle of May the fleet returns from the southern fishing and sails for the coast of Nova Scotia, on what is called the Cape Shore trip. The mackerel in that region follow along the coast of Nova Scotia on their way to the Gulf of Saint Lawrence. The Cape Shore trip usually is over by the middle of June. During the remainder of the summer the fishing may be in the vicinity of Block Island, in the Gulf of Maine or in the Gulf of Saint Lawrence.

Seining schooners carry crews of eighteen men each. One-half the gross stock of the vessel, after deducting the value of salt, barrels and gasoline used in making the stock, is divided equally among the vessel's crew; the other half goes to the owners of the schooner. The average share per man for a crew of eighteen varies from $22 to $28 for every $1,000 worth of stock, depending upon the expenses and the length of the trip. R.MC F.

Consult Murray's *The Depths of the Ocean;* Jordan's *Fishes.*

Related Subjects. The first section of the above article contains such general descriptive matter as applies to all fish. In these volumes, however, are included scores of articles on the different kinds of fish, and the list which follows will make reference to them an easy task. A few articles of a more general nature are also included in this index.

Alewife
Angler
Aquarium
Archer-fish
Bass
Bluefish
Candlefish
Carp
Catfish
Cod
Devil Fish
Dogfish
Eel
Electrical Fishes
Flatfish
Flounder
Flying Fish
Gar
Goldfish
Grayling
Grunt
Gurnard
Haddock
Hake
Halibut
Herring
Hippocampus
Jewfish
Lamprey
Lantern Fish
Lumpfish
Mackerel
Menhaden
Mullet
Muskellunge
Paddlefish
Perch
Pickerel
Pike
Pike Perch
Pilchard
Pilot Fish
Pipefish
Pompano
Ray
Redfish
Ribbon Fish
Salmon
Salmon Trout
Sardine
Sawfish
Sculpin
Shad
Shark
Skate
Smelt
Sole
Spawn
Sprat
Stickleback
Sting Ray
Sturgeon
Sucker
Sunfish
Swordfish
Tarpon
Tilefish
Torpedo
Trout
Tunny
Turbot
Whitefish
Wolf Fish

FISH, the family name of two American public men, father and son, one notable in political history, the other in business.

Hamilton Fish (1808-1893) won distinction as a lawyer, statesman and diplomat. He was born in New York City, was graduated at Columbia College (now Columbia University)

in 1827, and in 1830, after a course in law, was admitted to the bar. The first of several political honors came to him in 1842, when he was elected to Congress as a Whig. Six years later he won the governorship of New York, and in 1851 was sent to the United States Senate.

Fish became an active member of the Republican party on its organization, and from 1869 to 1877 made a good record as Secretary of State in the Cabinet of President Grant. He was one of the commissioners who negotiated and signed the Treaty of Washington with Great Britain, in 1871 (see WASHINGTON, TREATY OF), and he represented the interests of the United States in the settlement of the claims arising from the depredations of the Confederate cruiser *Alabama* (see ALABAMA, THE). Other diplomatic services included the settlement of the Oregon boundary dispute with Great Britain, and a satisfactory adjustment of the difficulty with Spain growing out of the Virginius affair (see VIRGINIUS MASSACRE, THE). He also brought about important reforms in the consular service, introducing the requirement of civil service examinations of candidates.

Stuyvesant Fish (1851-), son of Hamilton Fish, is an American capitalist and railroad official. He was born in New York, and, like his father, was educated at Columbia College. At the age of twenty, soon after his graduation, he entered the offices of the Illinois Central Railroad Company as a clerk, and rose to the presidency of the road in 1887, which post he resigned in 1906. Fish was chosen a member of the monetary commission created by the conference which met in Indianapolis in 1897, and from 1904 to 1906 was president of the American Railway Association.

HARRISON FISHER

FISHER, HARRISON (1875-), an American illustrator who has drawn over a thousand studies of American girl types. Simplicity is the keynote of his art. Although he easily pleases his patrons, he is a severe self-critic, often destroying the work of days because the result proves unsatisfactory to himself. He possesses a fine sense of humor and a love for the beautiful in life, which he brings out in his art. Fisher was born in Brooklyn, N. Y. His illustrations appear in the leading magazines and popular works of fiction, and he is the author of *The Harrison Fisher Book,* which presents in picture the American girl who wins by force of charm and personality.

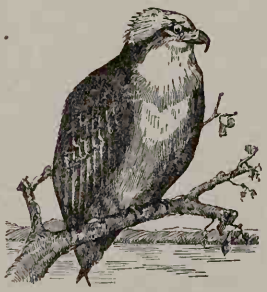
FISHER, SYDNEY ARTHUR (1850-), a Canadian statesman and agriculturist, from 1896 until 1911 Dominion Minister of Agriculture, a position in which he exerted great influence for the improvement of agricultural conditions in Canada. He was born in Montreal, attended the Montreal high school and McGill University, and in 1871 was graduated at Trinity College, Cambridge University. Returning to Canada, he devoted himself to scientific farming, particularly fruit-growing and the raising of live stock. He was closely identified with the Quebec Fruit Growers' Association and other organizations for improving the farming conditions of Quebec and the Dominion.

Fisher was an unsuccessful candidate for the House of Commons in 1880, but was elected in 1882 and sat until 1891, when he was defeated by a single vote. He was again elected in 1896 and became Minister of Agriculture in the Liberal Ministry formed by Sir Wilfrid Laurier. While Minister of Agriculture he secured the enactment of many laws in the interests of the farmers and the people at large, organized a health-of-animals branch and the permanent census and statistics branch, and established numerous experimental farms. To his efforts were also due the foundation of the National Art Gallery and the erection of a suitable building for the Dominion archives at Ottawa. He sat in the House of Commons from 1896 to 1911; he was defeated in the general elections of 1911 and was also unsuccessful at another election in 1913. G.H.L.

FISH HAWK, a large bird of prey of the eagle family, found near both fresh and salt water in almost every country. This bird, which feeds only on fish, is also called *fishing hawk, fishing eagle, sea gull* and *osprey,* the latter name being derived from a Latin word meaning *bone-breaker.* It is about two feet long, with body dark brown above, touched with black, gray and white. The under parts are white, sometimes banded across the breast with brown. The tail and wings are long. To aid it in securing food, the short, strong bill is sharply hooked, and the soles of its

strongly clawed feet are covered with pointed scales.

In America, the fish hawks range from Hudson Bay and Alaska to South America and the West Indies. They often live in colonies, but always in pairs. High on an exposed cliff, or in a large, dead tree near water, a huge nest, large enough to fill a cart, is built of sticks. There two to four eggs, brownish, yellow or speckled white, are laid, and when hatched the helpless young live in their airy home for several months. The parents circle gracefully high in the air watching the water for signs of food, which they swoop down upon with a wonderful dash. The bald eagle often pursues the fish hawk and frightens it into dropping its catch, so the latter often supplies food for two families.



THE FISH HAWK

She rears her young on yonder tree;
She leaves her faithful mate to mind 'em;
Like us, for fish she sails to sea,
And, plunging, shows us where to find 'em.
—Wilson:
Fisherman's Hymn.

FISHING. See Angling.

FISKE, *fisk,* John (1842-1901), an American philosopher and historian and exponent of the doctrine of evolution, was born at Hartford, Conn. He was the son of Edmund Brewster Green, his own name being Edmund Fiske Green, but after his mother's second marriage in 1855 he assumed the name of a great-grandfather, John Fiske. His early boyhood was spent in Middletown, Conn., where he was known as an unusually intelligent youth. He read and enjoyed Shakespeare at the age of eight and later far surpassed other boys in his knowledge of Latin and Greek. After his graduation from Harvard in 1863 he spent two years in the Harvard law school but never entered legal practice, preferring to devote himself to teaching, writing and lecturing.

In 1869 he gave a course of lectures on the *Positive Philosophy* at Harvard, and in 1871 delivered thirty-five lectures on the doctrine of evolution which attracted the attention of both Darwin and Herbert Spencer. In the winter of 1879 he lectured on American history in the Royal Institute in London, and after his return to America in 1884 was appointed to the chair of American history in Washington University, Saint Louis, Mo., although he continued to make his home in Cambridge, Mass. Among his contributions on evolution are *Destiny of Man, Outlines of Cosmic Philosophy, Myths and Myth Makers, Idea of God As Affected by Modern Knowledge, The Unseen World* and *Excursions of an Evolutionist.* By the clearness of his style he did much to spread a knowledge of Darwin and Spencer in America. It is, however, through his historical writings that his reputation will endure, as these form a continuous account of events from the earliest American discoveries. Although at times he failed in point of accuracy, he contributed much of value to the history of America. His best known historical works include *The American Revolution, The Beginnings of New England,* and a *United States History* for schools.

FISKE, Minnie Maddern (1865-), an American actress, born in New Orleans of theatrical parents. Most of her life has been spent upon the stage; in childhood she appeared with such celebrities as Laura Keene, John McCullough and E. L. Davenport. In 1890 she was married to Harrison Grey Fiske and retired temporarily from the stage. In 1893 she appeared in her husband's play, *Hester Crewe,* and later in Ibsen's *Doll's House* and *Tess of the D'Urbervilles,* the latter a play founded on Thomas Hardy's novel of the same name. In *Becky Sharp,* a drama written around Thackeray's *Vanity Fair,* she enacted one of her most successful rôles. The dominant note of her art is a strong intelligence combined with a keen sense of dramatic realism. She is the author of several plays, and collaborated with her husband in *Foutenelle.* In 1901 she opened Manhattan Theater in New York City, an independent playhouse in opposition to the American theatrical syndicate. Later she joined the great number of noted theatrical stars who have taken up moving picture work.

FISK UNIVERSITY, a coeducational school for colored people, founded in 1865 at Nashville, Tenn., under the auspices of the American Missionary Association and the Western Freedman's Aid Association of Cincinnati. Through the efforts of Clinton B. Fisk, after whom it was named, much was done to raise the standard of colored schools. A grammar school and preparatory college, normal, music and theological departments are maintained, as well

as the college. Each boarder is required to give one period a day to some manual work on the property. In 1914 there were forty-three instructors and 513 students, 206 of whom were in the college. The school has an annual income of about $60,000 from endowment and tuition.

FITCH, Clyde [William] (1865-1909), an American playwright and author, born in New York and educated at Amherst College, where he was graduated in 1886. He was a prolific writer and is credited with the authorship of more theatrical productions than were ever written by any other American. His work sometimes showed the effects of haste, but it was brilliant and distinctive. His first play, *Beau Brummel,* was brought out by Richard Mansfield in 1890, and was enthusiastically received. He was the author of a surprisingly large number of plays, including *The Climbers, The Way of the World, The Girl and the Judge, The Moth and the Flame* and *The Girl with the Green Eyes.* He also adapted many plays from the French and German, including *Sapho* and *The Masked Ball.*

FITCH, John (1743-1798), an American inventor whose life was a long struggle to impress people with the idea that steam power could be used to run a boat. He was born in Connecticut, and after working at many trades was appointed deputy surveyor of Kentucky. In making a map of the northwest regions of the United States the belief was forced upon him that the streams might be navigated by steam. He tried to sell his map to obtain money for experiments, but failed, so he appealed to several state legislatures for help. They refused, but he formed a company and built a small, though crude, steamboat. In 1787 his steam packet made a trial trip down the Delaware at the rate of three miles an hour. The boat Fitch invented used paddles like oars, and was impracticable for general commercial purposes. Had he applied the power to a paddle-wheel, he, instead of Fulton, would have been given the honor of inventing the steamboat. Fitch was given exclusive rights to steam navigation in New Jersey, Pennsylvania and Delaware, and in 1790 he built a boat to carry passengers. There was not enough money to finance this venture, so he went to France to introduce his invention. Failing in this, he returned to Kentucky, disappointed and poverty-stricken, and committed suicide two years later. See Ship; Fulton, Robert.

FITCH'BURG, Mass., the county seat of Worcester County, is a manufacturing city. It is in the northern part of the state, fifty miles northwest of Boston and twenty-eight miles north of Worcester, on a branch of the Nashua River. The city is served by the Boston & Maine, and the New York, New Haven & Hartford railroads and electric interurban lines. The population, which in 1910 was 37,826, was estimated to be 41,781 by the Census Bureau in 1916. About 10,000 of this number are French, and there is also a large Finnish population. The area of the city is twenty-eight square miles.

Fitchburg has an attractive location in the river valley and upon gently-sloping wooded hills. It has the Fitchburg state normal school, a Federal building, courthouse, state armory, Y. M. C. A. building, public library, the Burbank Public Hospital, Whalom Sanitorium, and homes for old ladies, working women and children. Coggshall is the largest of eleven parks. In the Upper Common are fountains of granite and bronze, and the city has a soldiers' monument, erected in 1874. The factories of Fitchburg employ 9,000 people. Important industries include extensive manufactures of revolvers and shotguns, paper, saws, machine knives, steam boilers, turned-wood novelties, axle grease, machinery, ginghams, screen plates, steam engines, steam pumps and machinists' tools.

Fitchburg was settled in 1719 and was a part of Lunenburg until 1764, in which year it was incorporated. It became a city in 1872 and includes the villages of West Fitchburg, South Fitchburg and Cleghorn. G.B.

FITZGERALD, Edward (1809-1883), an English translator and scholar, was born in Suffolk and educated in Trinity College. He was a recluse of extraordinary modesty, and it was only through the influence of friends such as Tennyson, Lowell, Thackeray and other noted men of letters that any of his work was given to the public. His fame rests almost entirely upon his translation of the *Rubaiyat* of Omar Khayyam. While he took great liberties with the original text of the *Rubaiyat,* aiming less at the exactitude than at the poetry of the author's thought, the result is a piece of exquisite workmanship justifying Edmund Gosse's definition, "coral building in literature." It is considered the standard among many excellent translations of the famous Persian poem, and is beginning to be recognized by the public not as Persian

but as English poetry. Mr. FitzGerald's writings include *Euphranor, Polonius* and *Readings in Crabbe;* among his translations are *Six Dramas of Calderon, Salaman and Absal* and *Agamemnon.* See OMAR KHAYYAM.

FITZPAT'RICK, SIR CHARLES (1853-), a Canadian statesman and jurist, Chief Justice of the Dominion after 1906. The city of Quebec was his birthplace and his home for over half a century. There he attended the seminary and Laval University, from which he was graduated in arts in 1873 and in law three years later. In Quebec City he established his reputation as one of the foremost criminal lawyers in Canada. From 1879 to 1887 he was Crown prosecutor for the city and county of Quebec. He was counsel for the defense in many famous trials, including that of Louis Riel in 1885, and for many years was also professor of criminal law at Laval University.

Sir Charles entered political life in 1890 as a Liberal member of the Quebec legislature, in which he sat until 1896, when he entered the House of Commons. He was Solicitor-General of the Dominion from 1896 to 1902 and Minister of Justice from 1902 to 1906. After his elevation to the Supreme Court in the latter year he acted several times as administrator of the Dominion in the absence of the Governor-General. In 1908 King Edward VII appointed him one of the British members of the Hague Peace Tribunal, and also made him a member of His Majesty's Privy Council. In 1907 he was created a Knight Commander of the Order of Saint Michael and Saint George, and in 1911 was given the Grand Cross of that order. G.H.L.

FIVE CIV'ILIZED TRIBES, the name given to the Indians belonging to the Cherokee, Chickasaw, Choctaw, Creek and Seminole nations in the former Indian Territory, now a part of the state of Oklahoma. They were given this name in government reports because of their readiness to adopt civilized standards.

These tribes were gathered mainly from the Southern states east of the Mississippi River, and were transferred to the reservation in Indian Territory in 1838 and the years following. For many years they were allowed practically to govern themselves, as though they were small republics under United States protection. Each tribe made its own laws, elected its own officials and conducted its own courts and schools. The tribal government was similar to state governments, with a governor, or principal chief, at the head, and a council composed of two houses, known by the peculiarly-Indian names of *house of kings* and *house of warriors.* All land was owned, not by individuals, but by the respective tribes in common.

After the War of Secession this tribal organization did not continue so successfully, and the government came to see the necessity of bringing the Five Civilized Tribes under its direct control. The principal reason for this was that many whites had come into the Territory and were asking for a share in the government, from which, as non-Indians, they were excluded. A contributing cause was that, since United States laws were not in force in the reservations, many criminals were evading justice by escaping to its borders. A further object, of course, was to meet the demand on the part of the country in general that unused lands be opened for settlement.

In 1893 the government took the first step toward the new order by appointing the Dawes Commission to work among the Indians, persuading them to allow their property to be divided among the individual members of the tribe and to accept United States citizenship. This work was carried on with success. In 1897 Federal courts superseded the old Indian courts, and the following year Congress provided, through the Curtis Act, for a commission to take the census of each tribe and to make fair division of its lands. The enrollment was finished in 1907, showing nearly 75,000 heirs to the vast estate of twenty million acres. It required several more years, however, to make the allotments of land. The division has left many of the Indians extremely wealthy, for their holdings include not only very fertile farming land, but valuable oil and coal fields. This wealth has been the cause of much intermarriage between whites and Indians, so at the present time only about a third of the members of the Five Civilized Tribes are full-bloods. The 1910 census gave the total membership of the tribes as 58,405.

In order to protect the Indians and their property from unscrupulous people, Congress arranged for all lands to be leased or sold under the supervision of a local bureau of administration called the Union Agency. This in turn is under the control of the Department of the Interior. Officials chosen by the Indians themselves have a certain voice in property transactions. The Five Tribes have special schools, but wherever possible the children at-

tend the regular public schools of Oklahoma; and as a good deal of the Indian land is not taxed, Congress appropriates a large sum each year for school purposes.

In time, as their education progresses still further and they show themselves able to assume full responsibility, the government will withdraw its protection entirely, and the Five Civilized Tribes will then become like any other unit of the great body of American citizens. See INDIANS, AMERICAN; OKLAHOMA; also the individual tribes referred to. E.S.C.

FIVE FORKS, BATTLE OF, an important battle of the War of Secession by which the net was drawn round the Confederate army and the close of the war hastened. This battle was fought in Dinwiddie County, Virginia, April 1, 1865. Lee had sent forces under Early to the Shenandoah Valley, hoping to draw Grant away; but Grant, in the meantime, sent Sheridan to oppose Early, who had been defeated in several preceding battles in the Shenandoah. Sheridan then destroyed the crops and the railroads of the entire valley, and it was later said that "if a crow wished to fly the valley's length he must carry his provisions with him." Lee's army was destitute, and he tried to join Johnston, whose forces had been scattered by Sherman, but the Union lines were too strong and Grant cut off his retreat. On the first of April Sheridan routed Lee's army at Five Forks and took 5,000 prisoners. Lee then withdrew his soldiers from Richmond and Petersburg, and a week later met Grant at Appomattox to arrange terms of surrender.

FIVE NATIONS, a confederacy of Iroquoian tribes which formed one of the most remarkable primitive governments ever known. It was organized in what is now the western part of New York state about the year 1570 by a chief of the Mohawk called Hiawatha, and included the chief's tribe and the Cayuga, Oneida, Onondaga and Seneca. In 1722 the Tuscarora were added, and thenceforth the confederacy was known as the Six Nations.

The organization was originally a defensive alliance against neighboring tribes. It had no executive, but was governed by a general council of the chiefs and sub-chiefs of each tribe and did not interfere with local government. It appointed two war chiefs. So effective was the coöperation of the five tribes that although outnumbered by neighboring enemies they advanced their borders and made their influence felt as far as the Mississippi River. But for the arrival of white men their sway might have been extended over the whole of the east, and they might have laid the foundation of a true Indian civilization by diminishing warfare.

Cartier, in 1534-1535, was the first white man to be seen by these Indians, and seventy years later Champlain aided the Algonquins against them. As a result, they allied themselves with the English against the French. In the Revolutionary War most of the tribes fought for the English, though the league was officially neutral. Afterward some of them were given homes in Canada. Of those remaining in the United States, the Oneida are in Wisconsin and New York and a few of the Seneca are in Oklahoma; the rest are on reservations in New York. See INDIANS, AMERICAN. E.S.C.

FIVES, so-called in Europe, but known as *handball* in America, is a game played by two or four persons on a level court enclosed by walls on three sides. A light rubber ball, about half the size of a tennis ball, is used. One player strikes the ball with his hand against the front wall of the court. It must then be returned in the same manner by the opponent after it bounces. The ball is kept in motion back and fourth between wall and court until one side fails to return it. Each failure to return the ball gives one point to the opponents. Fifteen points make a game. Fives is popular in England, especially at the two great schools of Eton and Rugby. See HANDBALL.

FIXED STARS, those heavenly bodies distinguished from planets by remaining apparently stationary, that is, maintaining their relative positions with regard to other stars. In truth, they are by no means stationary, but are flying through space with greater velocity than a rifle bullet; the vast distances between the stars and the earth prevent our eyes from distinguishing the movement. The so-called fixed stars include all the heavenly bodies except the planets, their satellites, comets and asteroids. See ASTRONOMY, for rate of speed of stars and distances from the earth.

It is much more difficult to calculate the directions and motions of these "fixed stars" than those of the planets, but astronomers by means of their delicate instruments and their complicated mathematics have made progress. For instance, the trend of those conspicuous stars which constitute the Great Dipper has been ascertained, and star maps have been made to show what that constellation will look like 100,000 years from now.

FJORD. See FIORD.

FLAG, the symbol of nations, the distinguishing mark of armies and fleets, departments of governments and parties, and the personal standard of rulers and officers. The word is derived from the Anglo-Saxon *flcogan,* meaning *to float* or *fly in the wind,* and it has the same meaning in English, Swedish, Danish, German and Dutch. The typical form of a flag is that of an oblong piece of cloth of light material, such as cotton or silk, attached to a staff, and bearing devices of special meaning. The end of the flag fastened to the staff is known as the *hoist,* and the length from the support to the free end is called the *fly.* The flag as it is known to-day is the result of many centuries of development. In the early dawn of civilization man felt the need of some token that would distinguish family from family and tribe from tribe, and from these ancient symbols came the standards which were emblematic of nations.

The earliest national symbols were figures worked in metal, wood or stone, borne at the top of a pole or spear. Standards of this character were carried in battle by the Egyptians, Hebrews, Persians, Assyrians and Romans. One of the most ancient Roman standards consisted of a wisp of hay fastened to the end of a pole, but the Latin student reads more frequently of the *aquila,* the eagle standard which was carried with the legions in time of battle. The Emperor Constantine had an Imperial standard made of purple silk, richly embroidered with gold. This usually hung from a horizontal crossbar, but at a later period it was sometimes attached to the side of a staff, constituting a flying flag. It is supposed that the waving flag originated with the Saracens. During the Middle Ages this form of standard came into general use. For the flags of different nations, see subtitles below.

There are several interesting customs in connection with the flags of to-day. Flags are borne on the masts of vessels to designate the country to which they belong, and also on war vessels, to show the rank of the officer by whom a ship is commanded. When a naval ship enters the port of a foreign nation it hoists the flag of that country and fires a salute of twenty-one guns. In the army, each regiment carries a flag as its distinguishing mark. Flags are used for signaling at sea, where, by international codes, ships may communicate with each other. Each nation, also, has its private code. See SIGNALING; SIGNAL CORPS.

To strike the flag is to haul it down, indicating surrender; *to dip* it is to lower it slightly and then to run it up again, a form of salute; if the flag floats half way up the pole it is said to be at *half mast,* a token of mourning; a flag *reversed,* that is upside down, indicates distress. A white flag, often called the *flag of truce,* is used as a token of surrender or as a sign that one of the combatants wishes to communicate with the other. A yellow flag waving over a hospital, vessel or fort means that there is contagious disease within and that the place is in a state of quarantine (see QUARANTINE). Red is the color associated with anarchy or mutiny. Historically, the red flag has often been used as the standard of an extreme revolutionary body, as the Commune of Paris of 1870, and it is the banner of anarchistic bodies to-day. Black banners are usually associated with piracy and warfare where no quarter is given or expected.

United States Flag

The story of the national emblem of the American people begins with the stormy days of the Revolutionary War. During the first few months of the struggle several different local flags were carried by the soldiers. At the battle of Concord, in 1775, a standard was unfurled which bore, in Latin, the motto, "Conquer or die," and at Bunker Hill, the same year, the pine-tree flag of the New England colonies inspired the American troops. On January 2, 1776, Washington raised over the American camp at Cambridge the first ensign of the united colonies, known as the Grand Union Flag of 1776. On its blue field were

combined the crosses of Saint Andrew and Saint George, symbolizing the union of Scotland and England, and it bore thirteen alternate red and white stripes. The king's colors on the blue field showed that the colonies still acknowledged the sovereignty of Great Britain, and the stripes represented the thirteen colonies.

After the adoption of the Declaration of Independence in 1776, it was felt that a national emblem of union and independence should be chosen, and on June 14, 1777, the following resolution was adopted in Congress:

"Resolved, that the flag of the Thirteen United States shall be thirteen stripes, alternate white and red, and that the Union be thirteen white stars on a blue field."

In this resolution were born the national Stars and Stripes. The flag then adopted had a circle of thirteen stars on a blue field. The story has come down that Mrs. Betsy Ross, flagmaker, residing at 239 Arch Street, Philadelphia, made the first flag and suggested that the stars be five-pointed. The Ross home is still standing, preserved as a memorial. A picture of the Ross home appears in the article Ross, Betsy.

John Fiske, the historian, says that the first American flag with stars and stripes that was ever floated to the breeze was one "hastily extemporized out of a white skirt and an old blue jacket, and some strips of red cloth from the petticoat of a soldier's wife." This crude emblem of a new nation was raised above Fort Stanwix in August, 1777.

THE BETSY ROSS FLAG

The gallant Paul Jones was the first of the naval heroes to make the star-spangled banner a symbol of glory. Placed in command of the *Ranger*, on the same day the flag was adopted by Congress, he sailed for Portsmouth, N. H., on the Fourth of July following, to raise the flag on his ship. As the naval committee presented the banner to him he said, "That flag and I are twins, born the same hour. We cannot be parted in life or death. So long as we can float we shall float together." In February, 1778, his flag received from the French fleet the first salute given the Stars and Stripes by a foreign nation, and in the following April, when the *Ranger* met and conquered the British man-of-war *Drake*, the flag floated for the first time in a naval battle.

In 1794 Congress ordered that after May 1, 1795, the flag should bear fifteen stripes, alternate red and white, and that there should be fifteen white stars on the blue field. This was done so that Vermont and Kentucky, which had been recently added to the Union, might be represented in the national banner. In 1818 Congress passed an act providing for the addition of one star to the flag whenever a new state should be admitted to the Union, and decreeing that henceforth the number of horizontal stripes should be but thirteen. It was decided that each star should be added on the Fourth of July following the admission of the state. At that time the character of the flag was fixed once for all, and stars have been added from time to time until the number is now forty-eight. The thirteen red and white stripes—the two outer ones red—symbolize the original states that won American independence.

Besides the national emblem, there are various other standards used in different departments of the national government. The revenue flag, consisting of sixteen perpendicular stripes, the flags of the admirals and other commanding naval officers, and the President's flag, are shown in the accompanying color plate.

What the Flag Stands For. In the years that have passed since the United States adopted the Stars and Stripes as its emblem, the flag has become to the American people a symbol of national growth, power and influence, of union and of liberty. What the flag stands for in the hearts of the people has been admirably expressed by Henry Holcomb Bennett in the following lines:

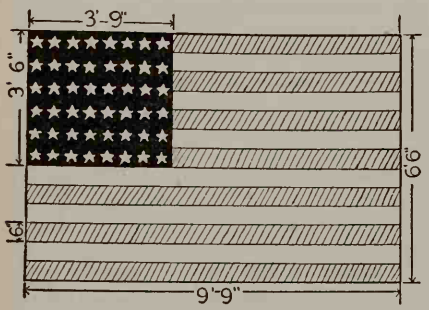
Hats off! Along the street there comes
A blare of bugles, a ruffle of drums,
A flash of color beneath the sky;
Hats off! The flag is passing by!

Blue and crimson and white it shines,
Over the steel-tipped ordered lines.
Hats off! The colors before us fly;
But more than the flag is passing by.

Sign of a nation, great and strong
To ward her people from foreign wrong;
Pride and glory, honor, all
Live in the colors to stand or fall.

Hats off! Along the street there comes
A blare of bugles, a ruffle of drums;
And loyal hearts are beating high:
Hats off! The flag is passing by!

How to Make a Flag. Teachers can provide an interesting and instructive exercise for their classes by having them make an American flag. A banner 9 feet 9 inches long and 6 feet 6 inches wide is one of convenient size, and the proportions, two-thirds as wide as long,



CORRECT PROPORTIONS OF UNITED STATES FLAG

are the same as those prescribed by United States army regulations (see diagram). The field of the union should be 3 feet 9 inches by 3 feet 6 inches, the stripes 6 inches wide. At the back there will be a canvas binding 2¼ inches wide.

The following materials are required: 8 yards of red bunting and 8 yards of white bunting, for the alternate red and white stripes; 3½ yards of blue bunting, for the blue field, or union; 2 yards of stout white muslin for the stars; ½ yard of canvas, 2 harness rings, 2 spools of white thread.

In making the diagram for the union, the length of the blue field should be divided into eighths and the width into sixths, which will give forty-eight oblong sections in which to sew the stars; there will be six rows of eight stars each. To mark the centers, make a pattern of one oblong and punch a small hole in the center. Then lay the pattern on each oblong and chalk the center. Full directions for making a five-pointed star, with illustrative diagrams, may be found in the article STAR. Before stitching a star to the blue field, overcast it with a close stitch and baste it on both sides of the blue. The stitching is done from point to point through the center of the star.

In cutting the cloth for the stripes, allow one-half inch for seams and one inch for a hem at the end of the flag. Plan to have the two outside red stripes selvage. Two harness rings ¾ inch in diameter are placed in the canvas strip 1 inch from the end, and at each back corner, where the rings are placed, the flag should be enforced by an extra piece of bunting, stitched flat, like a patch. Lay the harness rings on the canvas and mark the inside circle. Then cut the goods from the center of the circle to the mark in three or four places, and turn back on the ring, buttonholing over with stout linen thread.

Flag-Day Program. A program along the line of the one following, which has been approved by the educational authorities of New York state, will be found appropriate for the celebration of flag day in the public schools:

1. Chorus—The Star Spangled Banner.....Key
2. Declamation—The Stars and Stripes..Sumner
3. Essay—The Story of the American Flag.
4. Recitation—The American Flag.....Drake
5. Chorus—Battle Hymn of the Republic..Howe
6. Essay—What the Flag Stands For.
7. Declamation—The Man Without a Country .....Hale
8. Chorus—Hail Columbia .....Hopkinson
9. Recitation—The Blue and the Gray....Finch
10. Declamation—Gettysburg Speech ....Lincoln
11. Chorus—Tenting on the Old Camp Ground .....Smith
12. Salute to the Flag by the School.
13. Chorus—America .....Smith

State Flags. In connection with the article UNITED STATES there will be found two pages printed in color, showing forty state flags of the American Union.

Flags of the British Empire

The Union Jack.

It's only a small bit of bunting,
It's only an old colored rag,
Yet thousands have died for its honour
And shed their best blood for the flag.

It's charged with the cross of Saint Andrew,
Which, of old, Scotland's heroes has led;
It carries the cross of Saint Patrick,
For which Ireland's bravest have bled.

Joined with these is our old English ensign,
Saint George's red cross on white field,
Round which, from King Richard to Wolseley,
Britons conquer or die, but ne'er yield.

It flutters triumphant o'er ocean,
As free as the winds and the waves;
And bondsmen, from shackles unloosened,
'Neath its shadow no longer are slaves.

FLAGS OF THE TWO AMERICAS

THE FLAGS OF EUROPE
Britain
France
Germany
Russia
Norway
Sweden
Denmark
Austria-Hungary
Netherlands
Switzerland
Spain
Portugal
Italy
Belgium
Roumania
Montenegro
Bulgaria
Serbia
Greece
Turkey
KATE ABELMANN

It floats over Cypress and Malta,
O'er Canada, the Indies, Hong Kong;
And Britons, where'er their flag's flying,
Claim the rights which to Britons belong.

We hoist it to show our devotion
To our King, to our country, and laws;
It's the outward and visible emblem
Of advancement and Liberty's cause.

You may say it's an old bit of bunting,
You may call it an old colored rag;
But Freedom has made it majestic,
And time has ennobled the flag.

From the earliest times England, Scotland and Ireland had separate national emblems. England had the cross of Saint George; Scotland, the cross of Saint Andrew; and Ireland, the cross of Saint Patrick. When the crowns of England and Scotland were combined under James I, he commanded that henceforth the man-of-war's flag should be the "red cross commonly called Saint George's cross, and the white cross commonly called Saint Andrew's cross, joined together according to a form made by our heralds, and sent by us to our admiral to be published to our said subjects." This was in 1606 and was the first *Union Jack;* strictly speaking, it should be called the *Great union* or *Union flag,* and it is only a jack when flying from the jackstaff of a man-of-war.

Various changes were made in this flag by Cromwell, Charles II and Queen Anne. While Scotland and England thus had a common flag, each country continued to use its own jack. An English vessel, for example, would fly the Union Jack from the main-top and the English jack from the fore-top; a Scotch vessel would substitute the Scotch jack for the English jack at the fore-top. It was not until 1707, in the reign of Queen Anne, that the "two-cross flag," uniting the red cross of Saint George and the blue cross of Saint Andrew, was adopted as the national flag by Act of Parliament. For nearly a hundred years the "two-cross jack" was the emblem of Britain's power. During this century the British Empire encircled the globe; the two-cross jack was planted in India by Clive, Wolfe's victory on the Plains of Abraham placed it on the citadel of Quebec, and it was the first British flag to fly in Australia and South Africa.

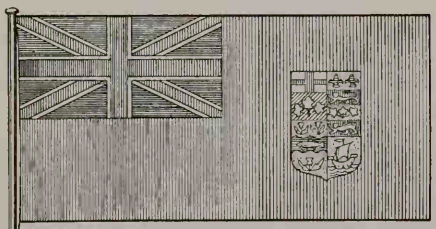
Ireland had long been ruled by the English king, but it was only in 1801 that the cross of Saint Patrick was united with the crosses of Saint Andrew and Saint George to form the Union Jack, which is still the national flag of Great Britain and its colonies. It is the most important of all British flags. It flies from all fortresses, garrison posts and armories in the British Empire, and is the proper flag to fly from public schools and private homes. With the Irish harp on a blue shield in the center it is the flag of the lord-lieutenant of Ireland. The star and arms of the order of India make it the flag of the viceroy. The Governor-General of Canada uses the Union Jack with the Dominion coat of arms in the center, surrounded by a garland of maple leaves surmounted by a crown.

The Three Ensigns. An ensign is a flag with an oblong Union Jack in the upper corner next to the staff and a field of red, white or blue. This corner, from the fact that the symbol of union was placed on it, is now itself called the *union.* The ensigns were originally all naval flags. In the days of great battle-fleets, such as that which met the Spanish Armada, there were usually three admirals, each with his special ensign. The admiral in command of the whole fleet used a plain red flag. The vice-admiral, who generally commanded the van, used a white flag, and the rear-admiral used a blue one. Later the combined crosses of Saint George, Saint Andrew and Saint Patrick were added, and until 1864 the three ensigns were used only by the royal navy. By a change in the regulations in that year, the royal navy retained only the white ensign, while the red ensign was assigned to the mercantile marine and the blue ensign to all government vessels except those of the navy.

The Royal Standard. The royal standard is also a union flag, for it is the symbol of the personal tie which unites all Britons throughout the world under one king. It is divided into four quarters, the first and fourth representing England, the second Scotland, and the third Ireland. The English arms in the first and fourth quarters are three gold lions on a red field; the Scotch arms are a single lion, in a heavy frame, in red on a gold field; the Irish quarter shows a golden, winged harp on a blue field.

The royal standard is the personal flag of the sovereign, and it should be displayed only "when the sovereign is actually present, or when any member of the royal family is present representing the sovereign." It should never be used for street decorations, but it is customary to fly it on the sovereign's birthday and on the days of his accession and coronation.

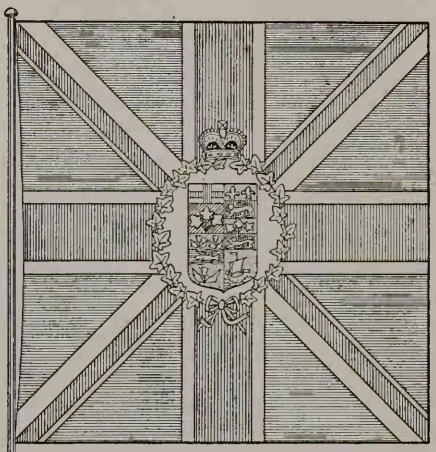
Colonial Flags. The Union Jack is the proper flag to fly on the Parliament and legislative buildings of British dominions. It is also the proper flag for schools. The Dominion of Canada, the Commonwealth of Australia, New Zealand, and the Union of South Africa all have a special national flag, which is the red or blue ensign with the proper



FLAG OF THE DOMINION OF CANADA

colonial arms in the fly. The Canadian flag, therefore, is the red ensign with the Canadian coat-of-arms displayed in the center of the fly. The red ensign is used at the opening and closing of Parliament and on national occasions of any sort. As in Great Britain, the blue ensign is used only on government vessels, except that the Indian Marine flies the blue ensign with the Star of India in the fly. All other ships and vessels belonging to His Majesty's subjects—

"shall wear a red ensign free from any badge or distinctive mark . . . . Colonial merchant vessels shall wear the red ensign as above, except those of Canada, Australia, New Zealand and



FLAG OF THE GOVERNOR-GENERAL OF CANADA

South Africa, which may by Admiralty warrant wear the red ensign with the badge [that is, the coat-of-arms] of the colony in the fly thereof. Any colonial merchant vessel may, however, carry a distinguishing flag with the badge of the colony thereon, in addition to the red ensign."

Flags of European Countries

The national flags of the principal European countries are shown on the accompanying color plate, THE FLAGS OF EUROPE. It is not necessary, therefore, to give more than a few words of explanation to each flag. In every case the flag shown is the national flag, and is that used by the merchant marine. The navies and the rulers of these countries have special flags which need not be described here.

Austria-Hungary. The Austrian flag has three broad horizontal bars, one white between two red; the Hungarian flag has the same design but the colors are red, white and green. For this reason the lower bar of the Austro-Hungarian ensign is half red and half green. The arms on the flag are those of Austria, at the left, and Hungary, at the right.

Belgium. This is one of the many nations which flies a tricolored flag, the black, yellow and red being the ancient colors of the principality of Brabant. With the royal arms in the center—a golden lion on a black shield—the flag becomes the royal standard.

Denmark. The Danish flag is the oldest now in use. The story goes that in 1219 the great king Waldemar II was treacherously attacked in his camp, and his own life and his army were only saved by a miracle. At a critical moment the king saw descending from Heaven a red banner with a white cross on it. With this flag at their head the Danes fought on to victory, and it has ever since been the emblem of Denmark.

France. The French flag dates from 1789, the year of the French Revolution. The *tricolour,* as it is popularly called, combines blue and red, the colors of the city of Paris, with the white of the royal house of Bourbon. The addition of the white was the suggestion of the Marquis de Lafayette, gratefully remembered for his part in the American Revolution.

Germany. The German flag, three horizontal bars of black, white and red, dates from the formation of the North German Confederation in 1867, and remained unchanged on the foundation of the German Empire in 1871. It

combines black and white, the colors of Prussia, with red and white, the colors of the Hanseatic League.

Greece. The colors of the Greek flag, blue and white, were adopted in 1833 in compliment to Otto of Bavaria, who became the first king of modern Greece. His arms were light blue and white, but after he was deposed in 1862 the Greek flag became dark blue and white, the present colors. The canton or union of the flag bears a Greek cross in white on a blue ground, this being the royal standard.

Italy. The flag of Italy—vertical bars of green, white and red—was designed by Napoleon I, his idea being to give the kingdom of Italy, which he created, a flag of its own, but at the same time to indicate its source by its close resemblance to the flag of France. In 1848 this flag was accepted by King Victor Emmanuel II of Sardinia, who added to it the arms of his family, the House of Savoy. When he became king of United Italy the flag was retained. It is exactly like the flag of Mexico, except for the addition of the arms of Savoy.

The Netherlands. When Holland became independent in 1579 it adopted as its flag the colors of William of Orange—orange, white and blue, and in 1599 it was officially decided that the flag should be composed of three stripes of equal width. Just when or why the orange was changed to red is not known—one historian says the change was probably due to the "indefiniteness of the orange and its liability to fade in the salt sea air." It is certain that by 1643 the Dutch flag had assumed the familiar form shown in the color plate.

Portugal. Although a republic since 1910, Portugal has kept the flag of the monarchy, with the royal arms. The arms were devised by King Alphonso I in 1139, to commemorate the victories over the Moors by which Portugal won independence. On a silver shield are five small blue shields arranged in the form of a cross, and each blue shield bears five silver spots. The five blue shields represent five Moorish princes whom Alphonso defeated, and the five spots are the five wounds of Christ, who gave Alphonso strength to conquer. A red border, with seven golden castles, was added in 1252 after King Alphonso III married a princess of Castile. On the national flag the arms are placed in an armillary circle of gold; this circle, added in honor of Prince Henry the Navigator, represents the relative positions of the principal celestial sphere. The fly of the flag is red, the national color, while the band of green is also in honor of Prince Henry.

Russia. The imperial standard of Russia, the double-headed eagle, dates from 1472, when Ivan the Great married the niece of Constantine Palaeologus and assumed the arms of the Eastern Empire. When Peter the Great began to create a Russian navy and mercantile marine he wanted a flag for his ships. He did the most natural thing under the circumstances; he adopted the colors of the Dutch, who had taught him how to build ships. Peter reversed the order of the bars, making them blue, white and red, but some later expert, realizing that a flag reversed was a sign of distress, again changed the flag to its present form.

The present Russian flag, reversed, was adopted by Serbia as its own emblem to commemorate Russia's aid in winning independence for its fellow-Slavs. Montenegro's flag is the same as Serbia's except for the initials H. I. surmounted by a crown.

Spain. The flag of Spain combines yellow, the color of Aragon, with red, the color of Castile. The flag of the royal navy has a broad yellow band enclosed by a narrower red band at top and bottom; on the yellow band and near the flagstaff are the arms of Leon impaled on those of Castile.

Switzerland. The Swiss flag is red with a white cross in the center, the flag of the mediæval Crusaders. An early Swiss chronicler, after giving a list of the Swiss forces leaving Berne in 1339 to march against an alliance of the nobles, tells why the flag was chosen: "All were distinguished by the sign of the Holy Cross, a white cross on a red shield, for the reason that the freeing of the nation was for them a cause as sacred as the deliverance of the Holy Places." The Swiss flag, with the colors reversed, is the familiar Red Cross.

Turkey. The origin of the Turkish flag is veiled in legend, but according to the story generally accepted is as follows. Philip of Macedon, father of Alexander the Great, was besieging Byzantium in 339 B. C. He was meeting with no success, but as a last resort attempted at night to undermine the walls. On the appointed night, however, the crescent moon shone so brightly that the defenders saw the attackers in time and saved the city. In gratitude to Diana the crescent was adopted as the city's emblem. When the Turks captured the city in 1453 they promptly appropriated the crescent and henceforth put it on

the plain red flags which they carried. However this may be, the crescent is certainly Byzantine in its origin, whereas the star's meaning is unknown. According to one account it was a part of the arms of Richard I of England and stood for the star of Bethlehem; according to others it is Al Tarek, the star of piercing brightness mentioned in the Koran.

Flags of Central and South America

Unlike the flags of other parts of the world, those of the Central and South American countries are mostly without historical or legendary background. Some of them were frankly copied from the United States or European flags, and others seem to have been chosen because somebody in authority thought they were pretty. Chile, Cuba and Panama show the influence of the United States flag, and Salvador has an obvious copy. Paraguay simply adopted the Dutch colors, to which it added a distinctive badge. Many of the flags, however, including those of Argentina, Bolivia, Guatemala, Honduras and Peru, have no distinction; they seem to be the national colors for no particular reason.

Brazil. This country's flag is an exception to the rule for Central and South America. The lozenge-shaped mass of yellow is unique, and it is one of the few flags to show a motto. On the band encircling the sphere are the words *Ordem e progresso*, meaning *order and progress.*

Costa Rica. The blue, white and red of this little country's flag seem to be taken from the colors of the United States, but the arrangement of the stripes, with a broad band of red in the center, is unusual.

Dominican Republic. This flag, of red, white and blue, is of an unusual design. A white cross of Saint George divides the field into four cantons, the first and fourth being blue, the second and third, red.

Mexico. The Mexican flag has three vertical bars, green, white and red. It is exactly like the Italian flag, except that the latter bears the arms of the House of Savoy in the center of the white stripe. Mexico adopted the Italian flag because it looked pretty, in spite of Italy's protests. When Mexico refused to abandon its new colors, the Italians changed their flag by adding the royal arms.

Uruguay. Uruguay's flag is like that of Greece, except that the order of the bars in the field is reversed, and the canton shows a sun "in splendor," whereas the Greek canton bears a white Greek cross on a blue ground.

Flags of Asia

China. Until 1912 the Chinese flag bore a silver dragon on a yellow or golden field. With the formation of the republic, however, this symbol of the ancient monarchy was abolished and a new flag adopted. It consists of five broad horizontal bands of color, in order from top to bottom, crimson, yellow, blue, white and black. These colors symbolize the five races or five divisions of the republic; crimson is for the Chinese proper; yellow, for the Manchurians; blue, for the Mongolians; white, for the Tibetans; and black, for the Mohammedans (Turkestan). This is the national flag, and is also used by the merchant marine.

Japan. The Japanese flags in their present form date only from 1897, but the designs, with only a little change, have been used for centuries. Appropriately enough this "land of the rising sun" uses a representation of the sun on its flag. The merchant flag shows only a red disk on a white field, but on the imperial navy's flag broad bands of red, like rays of the sun, radiate from the central disk. The imperial standard, a conventionalized golden chrysanthemum on a red field, is almost equally well known.

Siam. The "land of the white elephant" this country is called, and the national flag displays a white elephant in the center of a plain red field. The royal standard is the same, except that the elephant wears his harness and trappings and is standing on a platform, and in the upper corner, next to the hoist, is an anchor and wheel. (For the legend of the white elephant, and the veneration in which it is held, see SIAM.)

Persia. The flag of Persia is a "symphony in color," with its equal horizontal bars of green, white and pink. On the standard the green and pink bands are narrowed into borders, and on the wide, white central field is displayed a lion holding a sword. Above its back shows a blazing sun. B.M.W.

Consult Campbell's *Our Flag,* or *The Evolution of the Stars and Stripes;* Gordon's *The Flags of the World.*

FLAGEOLET, *flaj o let'*, a small wind instrument, formerly used in orchestras. Its sound is regulated by six holes, besides one each at the bottom, mouthpiece and behind the neck. Its compass is two octaves. The quality of its tone is shrill, but softer than that of the piccolo.

FLAGG, JAMES MONTGOMERY (1877-), one of the most successful of American illustrators and an interesting and witty writer. He works with equal ease in charcoal, crayon, pen-and-ink, water-colors and oils. Although he has won considerable success in portraiture, he is at his best as an illustrator. He possesses a gift of humor which seems inexhaustible. Flagg was born at Pelham Manor, now a part of New York City. At the age of fourteen his first accepted drawing appeared in *Life,* and when fifteen his work was bringing him an income of about $1,200 a year. Since then he has contributed regularly to many of the leading magazines and has illustrated several works of fiction. Notable among his own publications are *Yankee Girls Abroad, All in the Same Boat, If—A Guide to Bad Manners, Why They Married, The Adventures of Kitty Cobb* and *A Book of Tomfoolery.*

JAMES MONTGOMERY FLAGG

FLAG OF TRUCE, a flag, or any white material, hoisted by one of two warring parties to indicate a desire to communicate with the other. By international law and custom a flag of truce is granted certain privileges, but the general impression that all hostilities must necessarily cease as soon as a white flag is hoisted is wrong. Once acknowledged or accepted by the enemy, however, such a flag assumes a sacred character, and the person carrying it and bearing messages must not be harmed. Any attempt to take advantage of the use of a flag of truce for obtaining information is punishable by the sternest measures. Firing on a white flag after there has been an expression of willingness to "parley," or communicate, is regarded as treacherous. The same applies to the act of firing on the enemy while claiming the protection afforded by a flag of truce.

The hoisting of a white flag by a body of troops or garrison hard pressed does not imply instant surrender, but a desire to discuss terms for such surrender.

FLAIL, *flayl,* a hand implement in early days in use on the farm to thresh any kind of grain. The flail consisted of a short, thick club attached by a leather thong to a long wooden handle in such a way that it could swing easily. The threshing machine has taken the place of this primitive implement in all advanced countries, although the flail is yet employed by some Asiatics and Africans. In the Middle Ages the flail, made much stronger and furnished with iron spikes, was used as a weapon of warfare. It was one of the earliest of the world's weapons to be retained in the hand during combat.

THE FLAIL

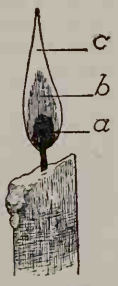
FLAME, the outward and visible sign of burning gas or vapor. When a candle burns it is not the solid wax that ignites, but the melted wax which has been drawn up to the top of the wick and there vaporized. A similar thing happens when we get flame from other solids or liquids.

Flame is always accompanied by heat, and generally by a bright flare of light. It is a mistake, however, to suppose that a substance is not properly a flame unless strongly luminous, for some gases burn with very little light. Hydrogen, for example, which burns at an extremely high temperature, has a very faint blue flame, almost invisible.

What Causes Flame. Flame is the result of the combustion that occurs when the solid particles of the gas—generally atoms of carbon—come into contact with particles of oxygen in the air (see COMBUSTION). Without oxygen there can be no flame. If we exclude air from a fire it will not burn; and if a lighted candle is placed in a bottle filled with "bad air" breathed out of the human lungs its flame will be extinguished almost immediately, because the oxygen in the air was used up before exhalation.

Its Triple Structure. If we take the flame of a candle or a gas-jet as a type and observe it

closely, we notice three distinct parts. First, there is the dark central cone (*a*) around the wick (see illustration), composed of gas or vapor that is not burning and cannot burn because entirely shielded from the air and not yet at a high enough temperature. The technical name for this inner portion is the *area of no combustion.* Surrounding this inner cone is a bright white envelope (*b*) called the *area of partial combustion.* This section of the flame is made up of carbon particles, freed from the gas by the high temperature and raised to white heat so that they give forth a bright radiance. It is this part, generally considered the true flame, that is responsible for almost all the light. The yellowish outer envelope (*c*) is known as the *area of complete combustion,* for here there is a plentiful supply of the oxygen needed for the combustion process. While this is the very hottest part of the flame, it gives almost no light, because as fast as the carbon atoms ascend into it they are consumed and changed into carbon dioxide and invisible water vapor.



FLAME
Explanation appears in text-matter.

What Makes a Flame Hot. The heat of a flame depends upon the rapidity and completeness of combustion, and it is oxygen that is essential for combustion. It follows, then, that if an extra supply of air can be mixed with the gas before it reaches the point where it is to be burned, more intense heat will result. That is why a blacksmith uses a bellows on his forge fire; why fireplaces and furnaces have draft-making chimneys; why the gas range and the Bunsen burner of the laboratory—both devices for supplying strong heat—are made with openings to admit air (see BUNSEN BURNER). Looking closely at the kitchen gas-stove, we find that the gas is blown from a little nozzle into a rather large pipe. There are air openings back of the gas nozzle, and what is consumed in the burner is therefore a mixture of gas and air.

Why a Flame Smokes. Smoke results from imperfect combustion; in other words, if there is not enough oxygen to feed it properly the flame will smoke. When the blacksmith is not using his fire it burns low, smoldering and smoking; when he needs it he applies the bellows, the flames leap up, the smoke disappears, and the fire gives forth the strong heat he requires for his purposes. In the modern oil lamp the glass chimney, resting upon a perforated bottom, permits a good circulation of air about the flame. If these perforations are allowed to become clogged with dirt or oil, a smoky flame and a poor light will result.

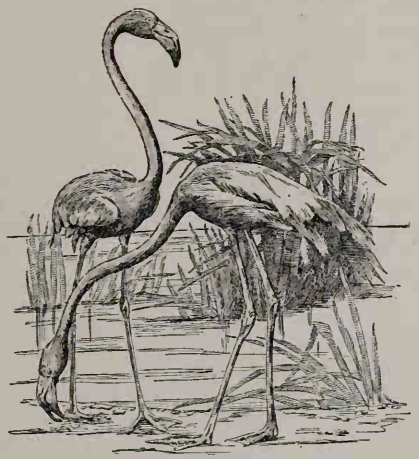
What Makes a Flame Luminous. The brightness of a flame, as is evident from the explanation of its structure, depends upon the number of solid particles suspended in it, throwing off light as they become highly heated. When gas manufacturers want to give additional brilliance to illuminating gas, they "enrich" it by the artificial introduction of other carbon gases. The luminosity of a flame is also affected by temperature. If the gas and the air are heated before being admitted to the burner, the flame will be correspondingly brighter.

Why Flame Ascends. A flame always ascends, not only because it is the natural tendency of hot gas and air to rise because of its lightness, but also because the flame creates its own draft. Immediately over it is a column of heated air; as this air rises, the cold air rushes in from all around to take its place. This is heated in turn, and there results a continuous flow of air to the flame and around it, creating a little wind or air current that blows the flame upward. If for any reason we want to send the flame in some other direction, we must supply an artificial draft. L.M.B.

FLAMEN, *fla'men,* in the ancient Roman religion the name applied to a sacrificial priest who was consecrated to the service of some special divinity. Originally, there were three: *Flamen Dialis,* priest of Jupiter, *Flamen Martialis,* priest of Mars, and *Flamen Quirinalis,* priest of Romulus. These constituted the *Majores,* and were always chosen from the patrician class; later twelve were appointed from the plebeians, and these were called the *Minores.* The *flamines* held office for life, but were subject to removal for neglect of duty. They were prohibited from leaving the city, from mounting or touching a horse, from touching a dead body and from numerous other acts which were supposed to contaminate them.

FLAMINGO, *fla ming'go,* an odd-looking, beautifully-colored, webb-footed water bird. With its gooselike body, long legs and long, slender neck, it stands from five to six feet high. The bill is big, naked and bent abruptly down, as if broken in the middle. The plumage, for which it has been sought and from which it takes its name, is usually deep ver-

milion, like a flame; however, it may be light red, pink or white, set off by black wing quills. A flock of flamingos in a marsh or on a river bank, or migrating in V-shaped flight, is a delight to the eyes. Several different species are found in Mediterranean and tropical coun-



FLAMINGOS

tries, and they were once common in the Southern United States; but hunters for plumage have so decreased their number that they are rarely seen north of Central America.

In feeding the flamingo buries its bill, top downward, in the water, then sways its head from side to side, causing currents of water to pass through the bill, where fine horny projections strain out the seeds and small water animals that are stirred up from the bottom by the bird's feet. The nest is really a mound of mud built high enough only to keep the eggs out of the water, and on this the mother bird sits with legs folded beneath her. The early Romans regarded flamingo tongues as a desirable delicacy, and these shared with peacocks' tongues the place of honor at the grossly-extravagant feasts of royal and princely houses.

FLAMMARION, *fla mah re ohN',* CAMILLE (1842-), a French astronomer and writer of scientific books. Some of his statements look so far into the future as to seem in part fanciful. He was born at Montigny-le-Roi, and studied at the Paris Observatory and later at the *Bureau des Longitudes.* In 1868 he began a series of balloon ascensions for the purpose of studying the heavens. In 1887 he founded the French Astronomical Society. He is famous for his original researches in astronomy, but is still better known for his excellent and accurate handbooks, many of which have been translated into English, including *The Unknown and Psychic Problems; Marvels of the Heavens; Urania; Lumen* and others.

FLANDERS, *flan'derz,* the old name of a portion of Europe including at one time the provinces of East and West Flanders in Belgium, part of the Dutch province of Zealand and the French department of Le Nord. Philip the Bold, king of France, appointed his son-in-law Baldwin to rule over this territory, with the title of count, early in the ninth century. Baldwin imported into the country great numbers of skilled makers of woolen goods and started the commercial progress of both Flanders and surrounding territories. Though at one time the counts of Flanders were more powerful than the French kings, the French on the south and the Dutch on the north gradually encroached on and lessened these dominions. On the death in 1477 of Charles the Bald, who, by marriage, had united Flanders with his own duchy of Burgundy, the Austrian house of Hapsburg became rulers of Flanders.

In Napoleonic times Flanders was incorporated with the French Empire, and by the Congress of Vienna was united to Belgium and Holland, forming the kingdom of the Netherlands. Between 1830 and 1832 Belgium gained its independence, retaining the present provinces of East and West Flanders. East Flanders has an area of 1,158 square miles, and is one of the most thoroughly cultivated provinces of Europe. The capital is Ghent, a noted manufacturing center. West Flanders, the capital of which is Bruges, has an area

LOCATION MAP
(*a*) West Flanders; (*b*) East Flanders.

of 1,249 square miles. During the War of the Nations both these provinces were overrun and occupied by the German armies. See BELGIUM; WAR OF THE NATIONS.

FLANNEL, *flan'el,* a woolen material, soft and yielding in texture, varying in weight and quality, made from loosely-woven yarn. Its origin is uncertain, but is assigned to Wales, where the fabric was manufactured as early as the sixteenth century. In modern times so many materials come under the term flannel that the word can hardly be considered as having an individual meaning. The flannel trade has suffered severe competition by the great increase in the number of imitations, but there is always a ready demand for the genuine article, as experience has confirmed its hygienic value for undergarments and bed-coverings.

FLATFISH, a name given various fishes, chiefly of salt waters, which have flattened bodies, with both eyes on one side of the head, and which swim on their sides. Some of the most important food fish, such as the flounder, turbot, halibut and sole, are flatfish. When these fish are first hatched, they are like all other fish, with eyes placed on both sides of the head. They soon begin to flatten, however, one eye moves over close to the other, the mouth becomes twisted, and the blind side, which is kept downward, loses its color. See each fish named, in its place in these volumes.

FLAT'HEADS, the popular name for the small civilized tribe of Salish Indians, now living on a reservation in Montana.

Originally the Salish were one of the most powerful of all the Western tribes, possessing great hunting-grounds on Flathead Lake and in Flathead Valley, Montana. They were courageous in war, honorable in all their dealings with white traders, and generally distinguished for their superiority over other tribes. None other of the Indian missions proved so successful as the Flathead mission, established in 1841 by a Jesuit priest, Father de Smet.

The name *Flathead* seems a curious contradiction, for the Salish were one of the few tribes that did not follow the old Indian custom of artificially deforming the head. This primitive practice has now died out, but in the early days it was common among the tribes living along the Columbia River and on the Pacific coast, such as the Choctaw, Catawba, Natchez, Chinook, and others, to whom the term *flathead* was very properly applied. Among the Chinooks, indeed, a naturally-formed skull was considered a mark of disgrace and fit only for slaves. The flattening was done in babyhood by making the cradle with a projecting head-board of wicker which, pressing down upon the infant's head, prevented natural growth and resulted in a peaked skull. It is likely that the name *Flatheads* was given to the Salish by their western neighbors in contempt and because they looked upon their own deformed heads as pointed rather than flattened. See INDIANS, AMERICAN.

FLATTERY, *flat'er i,* a cape at the southern entrance to the Strait of Juan de Fuca, in the state of Washington. It is the extreme western point of the United States, exclusive of Alaska. The name was conferred on this point by Captain James Cook, who stated that he was flattered by the false hope of finding a safe harbor there. There is a lighthouse half a mile northwest of the cape, on Tatoosh Island.

FLAVELLE, *fla vel',* JOSEPH WESLEY (1858-), a Canadian merchant and philanthropist, noted no less for his active and generous interest in many good causes than for his success in business. He was born near Peterborough, Ontario, and attended the public schools of that city, but after 1887 made his home in Toronto. His business interests are varied; he is president of a firm of pork-packers, and is an officer in several banks, a trust company and several large industrial firms. He endowed a professorship of Hebrew in Victoria University and a traveling fellowship in the classics in the University of Toronto, and is a governor of the latter. He has also been active in the management of the Toronto General Hospital and the General Board of Missions of the Methodist Church. In 1915 he was appointed chairman of the Imperial Munitions Board, a position corresponding to that of Minister of Munitions in Great Britain, but not a Cabinet office. The concentration in his hands of the executive and administrative duties regarding the supply of munitions was widely approved. In 1915 Flavelle was appointed a member of the national commission to inquire into agriculture, immigration, transportation and marketing of food products, with a view particularly to stimulating production in Canada to meet new conditions caused by the war. G.H.L.

FLAX, *flaks,* one of the most useful plants known to man, cultivated for its long, silky fiber, from which linen thread and cloth are made, and for its seed, which yields a valuable oil. The products of the flax fiber are found in wonderful variety, and include rare and delicate laces, shirtings and toweling, handker-

chiefs and tablecloths, twines, sailcloth, rope and cordage. From the seeds linseed oil is obtained; this is used in mixing paints and varnishes, in making linoleum and oilcloth and for medicinal purposes. Linseed meal, which is manufactured from what is left of the seeds after the oil is pressed out, is an excellent food for farm animals.

FLAX
Stalk and flower.

This valuable plant has been cultivated from the earliest historic period. Mummies over 4,000 years old, wrapped in linen cloth, have been found in Egyptian tombs, and flax is mentioned in the book of *Exodus* as one of the products of the country when it was ruled by the Pharaohs. Egypt still produces large quantities of flax, and the plant has also an extensive growth in India, Argentina, Uruguay, the United States, Canada, Russia, Austria-Hungary, Belgium, France, Holland, Rumania and Italy.

The so-called New Zealand flax, which is of economic importance in New Zealand and has been introduced into California for its fiber and into Europe as a decorative plant, is, strictly-speaking, not flax at all. Its correct name is *phormium*. Its leaves are sword-shaped and grow from the base of the plant, and its flowers blossom on a stalk once or twice the height of a man. The fiber is chiefly valued for rope and twine.

In the United States and Canada flax is raised chiefly for its seed, but farmers are beginning to cultivate it for the fiber. North Dakota leads in the United States in the amount of flaxseed produced, with 660,000 acres in 1915, yielding about 6,534,000 bushels. The annual yield of flaxseed for the United States is about 23,000,000 bushels. In Canada from 1910 to 1915 the yield varied from 4,000,000 to 17,000,000 bushels, Saskatchewan produced nearly six-sevenths of the Dominion's crop from 1911 to 1915.

Description and Cultivation. The country landscape affords no more charming sight than that of a field of flax in full blossom. The slender, erect stem grows to a height of two or three feet, branching near the top and bearing small nodding flowers of a beautiful shade of blue, though in some species the blossoms are white. Longfellow was thinking of the more commonly-known plant when he described the little maiden in his *Wreck of the Hesperus:*

> Blue were her eyes as the fairy flax,
> Her cheeks like the dawn of day.

The flax fibers, which are remarkable for their strength, fineness and silky luster, are found on the inner side of the bark, next to the central woody core. The best flax has fibers as long as the stem, running from the flowers to the roots.

Flax requires the utmost care in all stages of its growth. It thrives best in a strong, rich, well-drained soil, from which all weeds have been removed by previous cultivation, but crops can be grown on new ground. A good

AVERAGE ANNUAL PRODUCTION OF FLAX
The figures by comparison represent the average year's production of flax fiber, the raw material of linen.

yield cannot be obtained in a wet soil nor in one infested with weeds. Plants raised for the seed are mowed when they are ripe; those cultivated for the fiber have for ages been pulled up, root and stem, by hand, and before they have ripened. The reason for this is that the fibers become stiff and coarse if left too long, and cutting the stem with a mower would injure the best part of the fiber, which is found near the roots. Of late, many growers have adopted the quicker machine methods, notwithstanding the waste.

Removal and Preparation of the Fibers. When the stems have been pulled from the ground they are shaken free from dirt, tied into bundles, and drawn through iron teeth to remove the seeds at the top. This latter process is known as *rippling*. Next, the bark and inner core must be prepared for removal by a process known as *rotting*, or *retting*. That is, the stalks are steeped in running or stagnant water until the woody portions rot. Another

method, called *dew retting,* consists in spreading the stalks on the grass and exposing them to the action of the weather for several weeks. The stems are then dried so that the hard parts may become brittle.

Freeing the fiber from the stem requires two operations, *breaking* and *scutching.* In the first process the stems are pounded with mallets or run through a machine that breaks the hard portions to pieces but leaves the fiber

Figures Represent Millions of Bushels

FROM FLAX

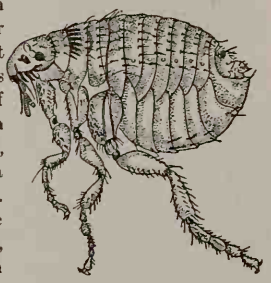
The above figures represent the average annual production of linseed oil and linseed meal, from flaxseed, in the countries or provinces named.

intact. Scutching is for the purpose of removing the broken pieces of the stem. The old method, and the one still employed in some places, consists in laying the flax over the end of an upright board, which is fastened in a block, and striking it with a flat, wooden blade. This knocks off the woody matter clinging to the fibers and leaves them free. A scutching machine, in which a number of knives attached to the arms of a vertical wheel strike the flax in the direction of its length, accomplishes the same result, and is now in general use. Finally, the fibers are *heckled,* or *combed,* so they may be separated into "line" and "tow." The flax line is the long fiber, used in fine linens and the like; the tow, the short and coarse fiber used in making coarse linen, twines, cordage, etc. M.S.

Related Subjects. The reader is referred to the following articles in these volumes:

Adulteration of Foodstuffs and Clothing
Linen
Linseed Oil
Spinning
Weaving

FLEA, *flee,* a troublesome wingless insect, some species of which pierce the skin and suck the blood of most all animals, leaving itching red spots. One species is found all over the world, tormenting cats, dogs, rabbits, poultry, and even biting human beings. Another species infests various birds. The true flea, so common in Africa and some European countries, which attacks human beings but does not attack animals, is rare in America, although it is found in parts of California. A curious flea called *chigoe* is troublesome in tropical America. Unlike other fleas which lay their eggs in the hair of animals, the female chigoe buries the forepart of her body in the flesh of human beings to lay her eggs there. That flea, however, is not the *jigger* of the Southern United States, which is the larva (young) of a mite.



So, naturalists observe, a flea
Has smaller fleas that on him prey;
And these have smaller still to bite 'em,
And so proceed *ad infinitum.*
—SWIFT.

The flea in the illustration is about twelve times the length of the insect.

Not only are fleas annoying, but it has been discovered that the bubonic plague (see PLAGUE) is transmitted through fleas from rats to man, as well as from one man to another. That fact suggested more careful study of this tiny, quick-jumping creature, so an exact wax model of the insect, 1,728,000 times the size of the living flea, has been made and is exhibited in the American Museum of Natural History in New York. In that model the biting parts of the insect are of special interest.

The common flea is about one-eighth of an inch long, somewhat flattened in shape and covered with a shell of hard, overlapping plates. In comparison with the body, the head is very small. Two threadlike feelers (antennae) lie in half-covered grooves behind the eyes, and can be lifted when needed. The beak consists of two inner and two outer parts. Between the two sawlike inner parts is a central part with a piercing point. The outer parts protect the inner ones. Two sharp-edged plates in front of the beak are used to help enlarge the wound made by the piercing parts.

Cleanliness is the best protection against this pest. If it has been brought into the home by animal pets numerous tiny, white, oval eggs will be laid and the number of fleas will soon increase, unless extreme care is exercised. From the eggs active, wormlike young will hatch. They will spin their silky cocoons in dust, and within about two weeks will appear as full-grown fleas. Thorough dusting of animals, rugs, etc., with pyrethrum, spraying with benzine and scrubbing with hot soapsuds will be effective. Spraying with oil of eucalyptus will also bring relief.

It is remarkable to note the cleverness of fleas which have been trained to do simple tricks. It is said that a wealthy man once paid $5,000 for such an insect. M.S.

FLEABANE, *flee'bane,* the popular name for several asterlike plants of the thistle family, so called from the mistaken idea, once strongly maintained, that they drive away or destroy fleas. *Canada fleabane,* also known as *horseweed, colt's tail, blood-stanch,* etc., is a weed common in waste places in Canada and throughout the northern Mississippi Valley. It is gathered when flowering and is carefully dried; in that form it is sold as *erigeron,* or fleabane, for stanching blood or for cases of diarrhoea and dropsy. It sells at from six to eight cents a pound. The fresh herb yields oil of fleabane. *Blue fleabane* is common in dry areas east of the Mississippi. It is also called *sweet scabious,* or *scabiosa,* and as a remedy for skin diseases is in great demand.

The old-fashioned cultivated *scabiosa,* or *mourning bride,* so-called because in Southern Europe the flower-heads are extensively used in making funeral wreaths, is a favorite garden plant whose tube-shaped florets of lavender, bluish-violet or pink are very attractive.

FLEM'ING, Sir Sandford (1827-1915), a Canadian engineer and publicist, the builder of the Intercolonial Railway, surveyor of the Canadian Pacific Railway's main line and inventor of the system of standard time. Fleming was born in Fifeshire, Scotland, but moved to Canada at the age of eighteen. He found a place on the engineering staff of the old Northern Railway, and in 1857 became its chief. A few years later he presented to the British government the request of the settlers in the Red River Valley for railway communication between Eastern Canada and the West. The result of this agitation was the Intercolonial Railway, whose right of way was laid out and its construction supervised by Fleming. On the completion of this work in 1871 Fleming became chief engineer of the railway now known as the Canadian Pacific, and by 1877 he had surveyed the entire route to the Pacific coast practically as it now exists. He also paid out of his own funds the expenses of locating a railway line in Newfoundland.

While these services made him a conspicuous figure in Canadian life, they should be regarded only as parts of his plans for consolidating the British Empire by railways, telegraphs and cables. As early as 1879 he proposed that an all-British cable should be laid to connect Canada with Great Britain on the one hand and Australia and New Zealand on the other; his plan, practically unchanged, was put into operation in 1902. After retiring from active engineering in 1880, Fleming returned to the problem of universal or cosmic time in which he had always been interested. As a result of his studies he proposed the system of standard time (which see), which is now in general use. Though not a politician in any sense, he took a very active interest in political affairs and frequently contributed vigorous articles on public questions to the periodicals. From 1880 until his death he was chancellor of Queen's University. He was an active member of numerous learned and scientific societies, and served in 1888 as president of the Royal Society of Canada. In 1897 Queen Victoria created him a Knight Commander of the Order of Saint Michael and Saint George. G.H.L.

FLEM'ISH LANGUAGE AND LITERATURE. The Flemish language is a form of Low German, spoken by a large number of the inhabitants of Belgium, especially in the provinces of East Flanders, West Flanders, Antwerp, Limburg and Brabant, and in parts of the Netherlands. It is closely related to the official language of the Hollanders, but retains several peculiarities of spelling and pronunciation not found in modern Dutch.

The history of Flemish literature is practically the history of Dutch literature until the separation of Belgium from Holland in 1830. When the revolution of that year made Belgium an independent state, French had long been used in government circles, and the Flemish language existed in the Low German provinces only in the form of spoken dialects.

About 1830, however, there began a remarkable movement for the revival of Flemish language and literature, and this movement was greatly aided by various laws passed by the Belgian government, whereby Flemish was put on an equal basis with French as the legal and official language of the kingdom. Moreover, Flemish was added to the course of study in the public schools, and in 1886 a Flemish Academy was established at Ghent. The Flemish movement produced many writers of distinct merit, and the revived Low German literature is represented by novels, poetry and plays.

FLETCHER, John. See Beaumont and Fletcher.

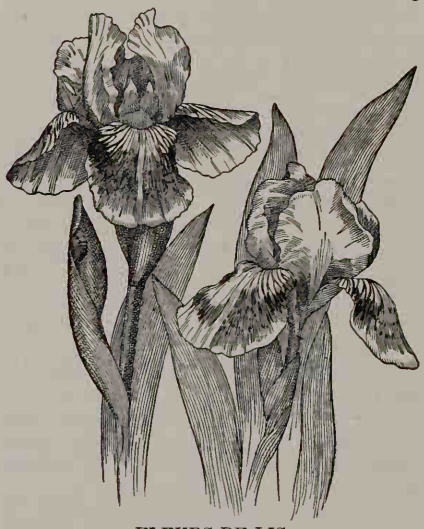
FLETCH'ERIZING, a method of masticating the food, which has been emphasized by

Horace Fletcher (born 1849), an American lecturer and writer. When Mr. Fletcher was forty years of age he was, according to his own statement, a physical wreck, and it was with the hope of regaining his health that he devoted himself to a study of the problem of nutrition. His theory, in brief, is that all bodily ills can be corrected by the proper mastication of one's food—that all solid food should be chewed until it is reduced to a liquid condition, when it will "excite in an irresistible manner the impulse to swallow." This is what Fletcher terms *natural mastication*, as a result of which the food "swallows itself." Moreover, food of every sort, liquid or solid, should be held in the mouth until all the good taste which it possesses has been extracted. He also believes that over-eating and eating at the wrong time are as much to be condemned as hasty eating, and that all three demoralize the digestive apparatus and lead to innumerable bodily ills. Never partake of food, he advises, unless a natural appetite for it has been created, and then cease to eat when the appetite "begins to slack up." With proper mastication poisons are eliminated from the body and fatigue is prevented, and the net result is a high standard of health, vigor of mind and body, and immunity from disease.

The benefits derived from thorough mastication are recognized by all physicians. Some, however, believe that Mr. Fletcher takes an extreme position that is open to criticism. The excessive secretion of saliva that results from prolonged chewing is held by some of his critics to be unwise, and may cause the teeth to decay and the gums to be diseased. Furthermore, his system tends to reduce not only the amount of food eaten, but the variety, and students of nutrition hold that the human organism demands a wide range of food. On the other hand, the people owe him their gratitude for having stimulated interest in the subject. He has done more than any other person to focus public attention on the evils of hasty eating and on the general problem of nutrition. See FOOD; DIGESTION; MASTICATION.

FLEUR-DE-LIS, *flur de lee',* the national flower of France, more generally known as the *iris.* The emblem of the French kings, a conventionalized form of iris, was also called fleur-de-lis. Many legends are related as to the origin of this emblem, but it was King Charles V who definitely fixed the French coat-of-arms as three golden fleurs-de-lis on a blue field. As a compliment to this king the practice was adopted, and still exists, of marking North on the card of a mariner's compass by a fleur-de-lis.

The plant has large, sword-shaped, rushlike leaves, and flowers with three outward curving



FLEURS-DE-LIS

petals and three smaller, inwardly arched parts. The colors range from white and yellow to mauve and purple, appearing in many beautiful combinations. It is found both cultivated and wild. Longfellow says of it:

Born in the purple, born to joy and pleasure,
Thou dost not toil nor spin,
But makest glad and radiant with thy presence
The meadow and the lin.

FLEXIBIL'ITY, a property of certain materials that makes it possible to bend them to a varying degree without breaking them. *Elasticity* causes the material bent to resume its former shape when the strain is removed. Flexibility, however, does not necessarily imply more than bending. A thin bar of iron is flexible; a bar of steel of the same thickness is generally both flexible and elastic. Flexibility enables a bow to be readily bent, but it is elasticity that causes it to spring back into position and propel the arrow. See MATTER, subhead *Properties of Matter.*

FLICKER, *flik'er,* one of the handsomest and most common birds of the Eastern United States and Southern Canada, known popularly as the *golden-winged woodpecker.* The name *flicker* is supposed to have been suggested by

its queer, loud note, which sounds a little like that word. It nests in holes of trees, and from the position of its nest it is also called *high-hole* or *high-holder.*

THE FLICKER

This bird is sometimes a foot long, with a long, slender and smooth curved bill; its prevailing color is olive-brown, with black markings. The head and neck are ash colored, the head showing a bright scarlet crescent. The under parts are brown, fading into yellow below the legs, and marked with round, black spots. Across the breast and throat is a broad black bar. In addition to all this, the under parts of the tail and wings are a rich golden yellow, and the rump and tail coverts are pure white, showing plainly when the bird is flying. The flicker feeds on worms, insects and berries; he is the farmer's friend, because he does little damage in comparison with the pests he destroys. He taps for his food, as do all woodpeckers; unlike that family of birds, however, this species also often feeds on the ground, and is sometimes mistaken for the meadow lark.

The flicker nests as far north as Central Alaska and east to the Canadian Atlantic section; it migrates from Canada in early fall, but in parts of the United States it is a permanent resident. The migration extends as far south as the Gulf coast.

FLINT, the mineral used by our forefathers for striking with steel to produce fire. It is a variety of quartz and usually is of a dark bluish-gray color. It is found in rounded lumps, called *nodules,* in masses of other rock. It is very hard, and when struck against steel produces a spark. It was the spark thus formed that set fire to the powder in the flint-lock musket of Revolutionary times. It is used now in the manufacture of some varieties of glass and in pottery of a high grade.

FLINT, Mich., locally known as the Vehicle City, because of its extensive automobile industry. It is situated south and east of the center of the state, in Genesee County, of which it is the county seat, and is fifty miles northeast of Lansing, the state capital, thirty-four miles southeast of Saginaw and seventy-three miles northwest of Detroit. It is on the Flint River, and on the Grand Trunk and the Pere Marquette railroads. An interurban line extends north to Saginaw and Bay City and another runs south to Detroit. The area of the city exceeds twelve square miles. The population in 1910 was 38,550 and in 1916 it was estimated by the Census Bureau to be 54,772. About seventy-five per cent of the inhabitants are Americans, and among the foreign-born are people of almost every nationality.

Flint is the home of the Buick Motor Car Company, and of the assembling plants of the Dort, Monroe, Chevrolet and Paterson automobile companies. In addition to these automobile plants, the city also contains manufactories of motors, carburetors, flour, woolen goods, cigars, paint and varnish, wheels, bicycles, iron, brick, tile and lumber products. There are large coal mines in the vicinity. The city is an important grain market.

Noteworthy buildings are a fine courthouse, a Federal building costing $100,000, city hall, Carnegie Library, banks, churches and two hospitals; one of these, Oak Grove, is a private institution for the treatment of mental disorders. There are twelve parks containing altogether 100 acres. In 1854 the Michigan School for the Deaf was established here. There are a number of business colleges and parochial schools, in addition to the public schools.

The first settlement, called Grand Traverse of the Flint, was made in 1820. It was incorporated as a village in 1831 and chartered as a city in 1855. The rapid growth of the place since 1869 has been due to the development of the vehicle industry. E.B.L.

FLODDEN FIELD, in Northumberland, England, near the Scottish border, is historically interesting as the scene in 1513 of a battle between the Scots, under James IV, and the English under the Earl of Surrey, as the representative of Henry VIII. An account of this conflict, in which the Scots were courageous but unsuccessful, may be found in Sir Walter Scott's *Marmion.* The Scottish dead numbered 10,000, and included the leading men of the kingdom. It is said that every family of importance lost one or more of its members.

FLOOD, *flud,* a body of water covering land not usually submerged. It is sometimes beneficial, sometimes destructive. The annual flood

of the Nile, which deposits on the plains of Egypt fertile soil from regions farther south, has enriched the country and has built the world's greatest oasis, and there are many lesser instances of a similar nature (see NILE). Sudden and violent floods bring huge losses, and the study of means of prevention is a task of growing importance. River floods are more frequent than sea floods, though not more serious.

River Floods. The Mississippi and its tributaries and the Hoang-ho, or Yellow River, in China, are noted for their tendency to overflow their banks. The Hoang-ho flows through a channel raised above the level of the surrounding plain partly by nature, partly by man-made dykes. When it breaks its banks it sometimes devastates an area as large as Great Britain. After each flood the river takes a new course; in the last 2,500 years its mouth has shifted over 200 miles, or nearly a mile every twelve years. Floods in the Mississippi basin are caused by excessive rainfall and sudden melting of snow and ice. The Upper Mississippi is not subject to them, but its lower course and its branches, the Ohio and the Missouri, frequently overflow.

The greatest flood in American history occurred in the states of Ohio and Indiana in April, 1913, in valleys tributary to the Ohio, principally along the Miami. It is commonly thought that such floods are due to the partial blocking of the river by bridge piers, filled land, sandbars and other obstructions, but engineers say that these are but minor sources of the trouble; the real difficulty lies in the fact that the natural channel of the Miami will hold only one-tenth as much water as it is sometimes given to carry; there are many other rivers even less capable of the work they may be called upon to do.

River lands become more liable to flood as the higher land surrounding them is stripped of trees and other vegetation, for then a heavy rainfall runs off rapidly and a river must do in a day the work of weeks in ordinary times. So tree planting is recommended as the first step in flood prevention. Also, reservoirs may be built which will hold back the water until the river can carry it off. The danger here is that a second great flood may immediately follow the first, overflowing, perhaps bursting, the reservoir. What would happen then is instanced by the very disastrous Johnstown (Pa.) flood in 1889. Levee building is a more common step. Much of the Mississippi below Cairo, Ill., is bordered by levees, but these frequently break and allow the stream to spread out, in some places to a width of seventy miles. On such occasions the damage to property is often millions of dollars.

Seacoast Floods. Floods from the sea are most frequently due to the piling up of the waters by high winds. Holland, which is partly below sea level, protects itself from them by its famous dykes, which in modern times seldom fail. In other regions such tidal waves come unexpectedly, and there is no provision against them. After its great flood of 1900, Galveston built a sea wall, but in the storms of 1915 this proved insufficient to protect the city completely. Earthquakes and volcanoes also produce waves, sometimes a hundred feet high. There have been notable instances of them at Lisbon, Messina and in Japan; at the eruption of Krakatoa in 1883 a large vessel was swept inland a mile and a half and stranded thirty-nine feet above the sea. R.D.M.

Related Subjects. The reader is referred to the following articles in these volumes:

Earthquake	Lisbon
Hoang-ho	Mississippi
Johnstown, Pa.	Netherlands
Levee	Nile

FLOOD PLAIN, a term used in physical geography to describe a plain formed of sediment deposited by a river. Floods in high regions carry off quantities of earth and other matter, which are deposited lower down in the plains by the flooding of the river channel. The overflowed waters lie practically still on the surface of the land and a natural deposit occurs. This is clearly illustrated along the banks of the Mississippi River, where flood plains covering an area of 50,000 square miles have been formed by the deposits from the often-flooded river. In the case of the Mississippi flood plains, the deposits are so light that the river is constantly washing out new channels.

The nature of the deposit varies greatly, and is governed by the violence of the flood and the nature of the country through which the stream passes. A raging torrent will carry gravel, stones and even small rocks, while a flood of less violent proportions might carry only light gravel; sluggish waters would contain only fine silt, slowly carried along. A flood plain may be caused by a bank or bar across the river mouth, which compels the river to drop its load, which gradually accumulates until sometimes it forces the river

from its original channel. The Rhine, Nile, Po and the Ganges are remarkable for their flood plains, but in none of these cases is the action of the river in forming them so clear as in the Mississippi.

FLO'RA, in Roman mythology, the goddess of springtime and flowers, whose temple at Rome was located near the Circus Maximus. Her annual festival, called the *Floralia,* began April 28 and lasted for six days, and was characterized by excessive hilarity and abandon. She is represented in art as a flower-bedecked and beautiful maiden, usually holding a cornucopia.

In botany the word *flora* signifies all the plant life of a region, as *fauna* signifies the animal life.

FLORENCE, *flawr'ens,* famed as the center of Italian culture when it was at the height of its glory, is one of the world's most interesting cities. It is situated in Central Italy, at the base of the Apennine Mountains, 140 miles northwest of Rome, and is built on both banks of the winding Arno, whose fertile valley, covered with vineyards, groves and orchards, affords the city an ideal location. Florentines call it *Firenze la Bella* ("Florence the Beautiful"), but it might also be called the "City of Famous Men," for with its wonderful past are connected the names of Dante, Petrarch and Boccaccio; of Cimabue, Ghirlandaio, Andrea del Sarto, Filippo Lippi and Leonardo da Vinci, the painters; of Michelangelo, Luca della Robbia, Donatello, Ghiberti and Cellini, the sculptors; of Brunelleschi, the architect; of Machiavelli, the statesman; of Galileo, the philosopher; of Savonarola, the theologian; of Americus Vespucius, the navigator; of Lorenzo de' Medici, patron of art and literature, and of many others, sons of Florence either by birth or by adoption.

Famous Structures. The view of Florence from the Viale dei Colli (Road of the Hills), a magnificent carriage-way passing along the hills to the south, is one of striking beauty. Perhaps first to attract attention would be the three buildings in the Piazza Duomo (Cathedral Square)—the beautiful Cathedral of Saint Mary of the Flower, the graceful Campanile, or bell tower, of Giotto, and the historic eight-sided Baptistery, with Ghiberti's wonderful bronze doors. The Arno, dividing the city into unequal parts, is spanned by six bridges, four of which are old stone structures in the medieval style. The Ponte Vecchio (Old Bridge) is of particular interest, because its thoroughfare is still bordered with quaint, rambling houses of the goldsmiths, built in the Middle Ages. It has an upper passageway connecting the city's two famous art palaces—the Uffizi and the Pitti. Another structure of special interest is the Palazzo Vecchio (Old Palace), once the seat of government of the republic of Florence, and now containing the city's government offices. This is an imposing building surmounted by a lofty tower, the great bell of which was once used to warn the people of danger. Many churches and palaces associated with memories of the old days are still in use, and so, too, is the old monastery of San Marco, of which Savonarola was prior.

Art Treasures. The art of Florence held a supreme position among the schools of the Italian Renaissance, and the great Pitti and Uffizi palaces (each described in these volumes under its title) contain collections of priceless value. In the Church of San Lorenzo may be seen the famous statues over the tombs of Giuliano and Lorenzo de' Medici, the work of Michelangelo. There are reproductions of these in plaster in the Art Institute of Chicago. The city's oldest church, Santa Maria Novella, contains paintings by Cimabue and frescoes by Filippo Lippi and Ghirlandaio, and the famous angel figures executed by Fra Angelico are on the walls of the monastery of San Marco. One of the most notable of the artistic treasures of Florence is the dome of the great Cathedral. This was so much admired by Michelangelo that he used it as a model for that of Saint Peter's at Rome. The church contains sculptures by Ghiberti, Luca della Robbia, Michelangelo and other famous artists. Among other celebrated works are the tombs of Michelangelo, Machiavelli and Galileo, in the Church of Santa Croce (Holy Cross). Here, too, is the empty sepulcher of Dante.

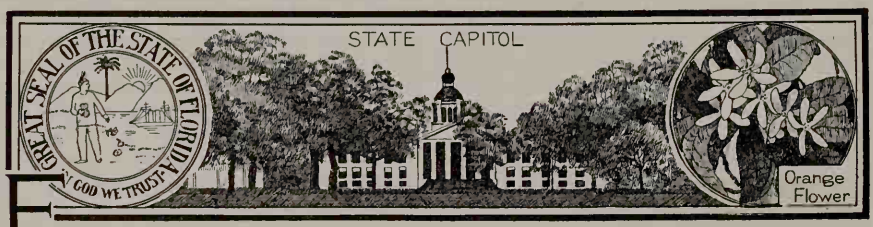
History. Florence was probably founded as a Roman colony late in the second century B. C. During the Middle Ages it became a prosperous commercial city, and the headquarters of money-changers, jewelers and goldsmiths. Between 1282 and 1530 a republican form of government was maintained, and at various times powerful merchant guilds or wealthy families were at the head of affairs. The famous family of the Medici continued in power from 1434 until 1737. After the fall of the republic a ducal government was established by Emperor Charles V, one of the Medicis being created Duke of Florence. In 1569 Flor-

ence became the capital of the Grand Duchy of Tuscany, and after the new kingdom of Italy was constituted it was for a time the seat of government (1865-1871). It is now the capital of the province of Florence. In 1915 the city and suburbs had an estimated population of 242,147. B.M.W.

FLORENCE, Ala., an important manufacturing center, and the county seat of Lauderdale County, situated in the extreme northwestern part of the state, on the Tennessee River, at the foot of Muscle Shoals Canal. Birmingham is 125 miles southeast, Nashville is 125 miles northeast; Chattanooga is 150 miles northeast, and Memphis is 150 miles northwest. Two railroad lines, the Louisville & Nashville and the Southern railways, provide transportation. Electric railways operate between Florence, Sheffield and Tuscumbia, and steamboats connect with Chattanooga, on the north, and the Gulf of Mexico, on the south. The town was laid out in 1818 by an Italian from Florence, and he named it for the famed Italian city. In 1889 a city charter was granted, and in 1914 the commission form of government, with three elective officers, was adopted. The population in 1916 was 6,689.

The city is located on a plateau 200 feet above the river, which at this point is spanned by a steel bridge. Wildwood Park of 250 acres, a large Indian mound and an old military road through the city, cut out by General Andrew Jackson from New Orleans to Nashville, are features of interest. The most notable buildings are a $140,000 Federal building, completed in 1914, and the Jefferson Hotel. The state normal school was erected at a cost of $85,000; the girls' dormitory, built in 1913, cost an additional $75,000. This and the Burrell Normal School, the Florence Synodical Female College, Mars Hill Academy and a library offer excellent advantages for higher education.

Florence is situated in a coal, iron and lumber region, and though the manufacture of pig iron, boilers, engines, wooden pumps and wagons is extensive, the people are largely engaged in cotton and fertilizer industries. The water power of the Muscle Shoals at this point is considered second only to that of Niagara Falls, and plans are under way for developing this power by the construction of three dams, which will greatly increase manufacturing facilities. E.J.



FLORIDA, the "land of flowers," the winter playground of Eastern America, the home of the pineapple and of a large part of the tropical fruit supply of the United States, is the southernmost state of the American Union. As five-sixths of its length, or 375 miles, with an average width of about ninety-five miles, is almost entirely surrounded by water, it is called the *Peninsula State.* The name *Florida* is the Spanish word for *flowery,* and was given by Ponce de Leon, who discovered it on Easter Sunday, which in Spanish is called *Pascua florida,* or *flowery Easter.*

Alabama and Georgia touch its almost straight northern boundary of about 400 miles; and dividing it from Alabama on the extreme northwestern corner is the Perdido River. On the east is the Atlantic Ocean, on the south and west, the Gulf of Mexico. A chain of islands extending in a curved line 200 miles along the coast at the south, called the Florida Keys, is included within these boundaries. Florida has the longest coast line of any state —almost 1,200 miles—more than half the distance between Chicago and San Francisco. Covering an area of 58,666 square miles, it is about the same size as Georgia, but has less than one-third the population, this being reported as 904,839 on January 1, 1917. The province of Alberta is over four times the size of Florida, but its population is only a little over three-fifths as great.

The People and the Cities. Over forty-one per cent of Florida's population is colored. Of the remainder, about 34,000 were foreign-born —from the West Indies, England, Germany,

Italy, Canada and Spain—and there are fewer than 400 Indians left in the state to represent the historic race of Seminoles.

Tallahassee, in the extreme north-central portion of the state, is the capital. The largest cities are the harbor cities of Jacksonville, Tampa, Pensacola and Key West. In those four cities almost one-fifth of the state's population is concentrated, busy in the shipping of fruits, cotton, cigars, lumber and forest products and vegetables. Naval stations are maintained at Key West and Pensacola.

Land Surface and Waters. Excepting Louisiana, Florida has the lowest average elevation above sea-level of any state in the American Union. Its greatest height is a central divide, a ridge from 100 to 274 feet high, which separates the rivers flowing into the Atlantic from those flowing into the Gulf. Over six per cent of the area of the state is water.

The northwestern part of Florida, an extension of Alabama uplands, is a hilly, rolling country. The coastlands are low, level, and in many places marshy, with numerous sand and coral reefs and narrow islands, which enclose long, shallow lakes, lagoons, rivers and bays, such as Indian River and Lake Worth, on the east coast. The most remarkable coral formations are the Florida Keys.

Florida might be called the state of lakes, for within its central region there are estimated to be 30,000 lakes, most of them very shallow, however, and due to sinkholes or hollows in limestone. The largest of these, Lake Okechobee, is described under its title in these volumes. To the east of Lake Okechobee lies the world-famed Palm Beach. Others of the larger lakes are Orange, Apopka, Kissimmee, Istokpoga, Tohopekaliga, Crescent and George.

South of Lake Okechobee a large part of the peninsula is covered by the Big Cypress Swamp and the Everglades. The presence of these vast grass- and cypress-fringed swamps and of the Everglades, which alone cover an area of 5,000 square miles, or over eight per cent of the area of the state, has given to Florida the name of *Everglade State,* as well as *Peninsula State,* mentioned above. For many years work has been conducted to affect the drainage of the Everglades to reclaim the land for agricultural purposes, and in 1913 a state appropriation of $6,000,000 was made toward that end.

Among Florida rivers, Saint John's is one of the most important. For almost 400 miles it winds its way northward from Lake Washington, near the east coast at about the middle of Florida, and passes through several other lakes until it enters the Atlantic Ocean. Its course, bordered with semi-tropical vegetation, is a delight to tourists. Another beautiful

OUTLINE MAP OF FLORIDA

Here are shown the boundaries, principal rivers, chief cities, mineral deposits and the highest point of land in the state.

river is Ocklawaha, in the center of the state. Other rivers of importance are Saint Mary's, forming part of the boundary between Florida and Georgia; the Caloosahatchee, which, connected with a drainage canal through Lake Hicpochee, drains Lake Okechobee into the Gulf of Mexico; the Kissimmee, flowing southward into Lake Okechobee; the Peace, flowing into Charlotte Harbor on the west coast; the Suwanee, crossing the state from the north, and the Apalachicola, an extension of the Chattahoochee and Flint rivers of Georgia. Two smaller rivers, the Withlacoochee and the Hillsborough, have recently been developed to furnish electric and water power. The Suwanee, famed in the song known in every household, is a small, unimportant and not especially beautiful stream.

Throughout the state are numerous springs and underground streams connecting lakes. Some of the springs contain health-giving properties and are visited by invalids from all parts of the world. Wakulla Spring in the northwest, probably the largest spring in the world, is about 500 feet wide and 100 feet deep. Not far from Saint Augustine, on the

east coast near the north, two miles out at sea, one spring comes to the surface with such force that ocean waves roll back from it as though it were a low reef. It has been estimated that about 400 tons of limestone are worn away each year by Florida's springs.

Harbors and Coast. The eastern shore line is very even, but, as it is bordered with numerous sand reefs, it has a few good harbors. Biscayne Bay at the extreme south, and the harbor of Saint Augustine near the north, are used to some extent by merchant vessels. The mouths of the Saint Mary's and Saint John's rivers, near the north, have been improved so that vessels can steam as far as Fernandina on the former and Jacksonville on the latter.

The western coast has the best harbors, and large vessels enter Charlotte Harbor and the bays of Tampa and Pensacola. Among the Florida Keys are numerous good harbors, but the one at Key West, on the westernmost key and actually west of Tampa, is the most important commercially. At Ormond, about fifty miles south of Saint Augustine, the beach is smooth and hard and is a favorite spot for automobile races.

Climate, Vegetation and Animals. Florida is a state of even and healthful climate. It lies far enough south to be almost entirely free from severe cold, and summer heat is modified by the ocean on one side and the Gulf on the other. The average winter temperature is 60°; frost is almost unknown. In summer the average temperature is 78°, and the thermometer rarely rises higher than 90°. Summer is said to last two-thirds of the year, and there are on an average 250 clear days. A daily paper in Saint Petersburg advertises that it makes no charge to its subscribers for their papers on days when the sun does not shine in that city; it has very few "free days."

June, July and August constitute the rainy season, and the rainfall is heavy, being fifty-five inches at Jacksonville and over sixty inches in some places on the gulf coast. Though fevers occur in some sections, there are so many delightful spots that Florida has become the winter playground of the North and a sanitarium for thousands of invalids. Those afflicted with throat or mild lung diseases find the dry pine regions especially beneficial.

This state is rich in subtropical vegetation. It is a place of royal palms and flowers in luxuriance almost the year round; with regions abounding in orange trees (the fragrant orange blossom being the state flower) and fig, lemon, guava, pomegranate, banana and olive trees, pineapple, tobacco and sugar cane plants. In the forested spots, which cover a large portion of the state, are found cypress trees, long-leaf pines, live oaks, great masses of curious mangroves, and numerous other trees of value and interest. In addition to bright-hued birds like herons, flamingos and parrots, with their gay attire, there is much to attract the sportsman. Wild turkeys and game birds are abundant. Deer, raccoons, opossums and a small species of black bear are found. Alligators and turtles and tarpon, shad and other game fish fill the waters. Rattlesnakes, poisonous serpents and insect pests are also abundant in certain sections. Yet to many lovers of the wonders of nature, Florida is a place of enchantment, a "land of delicious lights and floating shades."

The Land and Its Products. Florida has the distinction of growing over ninety-nine per cent of some of the tropical crops of the United States, namely, avocado pears, bananas, kumquats, limes and pineapples. It is the home, too, of the grape fruit and the tangerine, of which its production is nine-tenths of the nation's. More important, though, is the orange yield, which is only one-third that of California but brings the state several million dollars each year. Peaches, pears, pecans, grapes, figs, plums and prunes, lemons, guavas, mangoes, apples, persimmons, walnuts, mulberries and cocoanuts are also raised.

The crop which brings the largest return to the state is corn, of which about 12,000,000 bushels are produced each year—twice the amount harvested in 1905. Sea island cotton and peanuts add several million dollars to the wealth of the state each year, and sweet potatoes, potatoes, sugar cane and tobacco are nearly as profitable. But next to the fruit yield in importance are the vegetables, which are grown for the early demands of Northern markets. Tomatoes bring the largest total returns, but distinctive crops such as eggplant, green peppers and okra are receiving increasing attention.

Stock raising is an important branch of agriculture, horses, mules, pigs, sheep, milch cows and other cattle being numerous. The timber lands of Florida are of vast importance, large quantities of such products as pitch-pine, tar, turpentine and rosin being exported each year.

Minerals. There are comparatively few minerals in Florida, but phosphate rock is found almost everywhere in the state. In some sec-

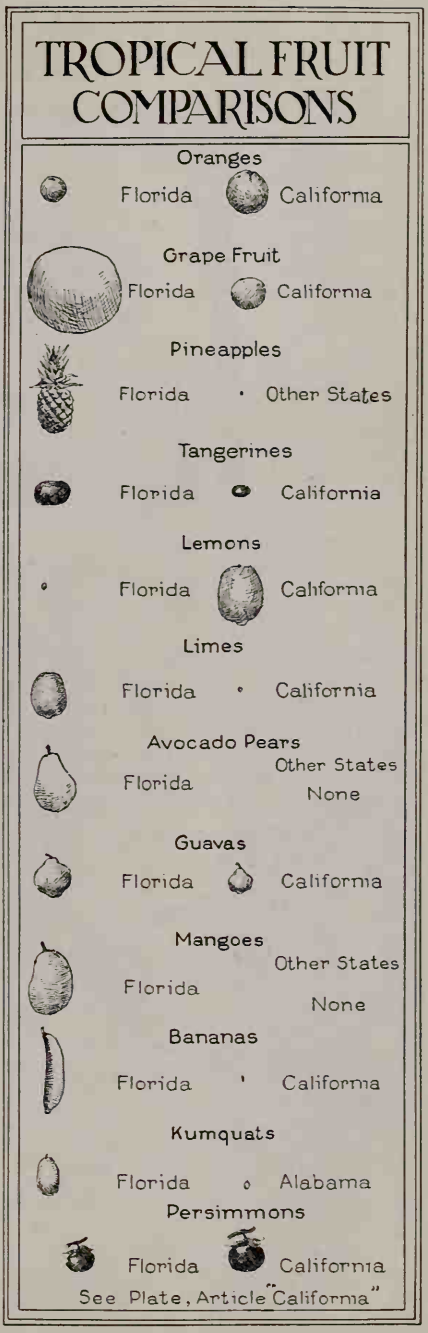
tions it is mined in great quantities and exported for fertilizer. Florida ranks first in quantity and value of this rock, with an annual output of over $9,500,000, an average of about $32,000 each working day. Fuller's earth is an important product, Florida being the first state in the Union in its production. Kaolin, lime and mineral waters are also of some commercial importance. Mineral products of the state were valued at over $10,508,000 in 1913; in 1914, $8,497,688.

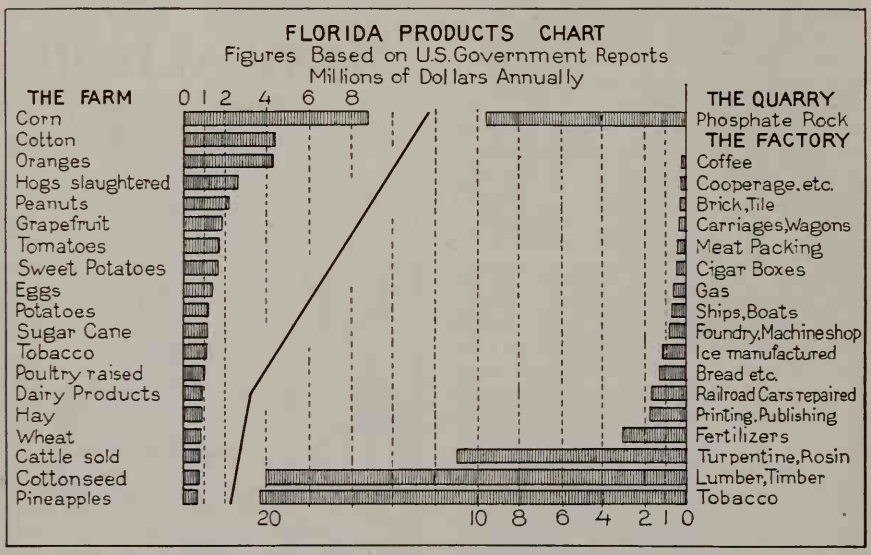
Fisheries. Florida has extensive fisheries along its coast line, which are more important than those of any other Gulf state, although they are not fully developed. Shad, red snappers, mullet and turtles are the chief fishery products, and Florida has almost a monopoly on the American production of sponges. Alligators are also sought for their skins, and there are several profitable "alligator farms." Pensacola is said to be the most important fresh fish market on the Gulf. Florida fisheries are valued at almost $3,400,000 a year, on the average, and nearly 6,000 fishermen are employed.

Other Industries. Key West and Tampa compete with Cuba in the making of cigars and cigarettes, although most of the tobacco leaf used is imported from Havana, Cuba. The yearly tobacco output is estimated at about $20,000,000. The importance of the manufacture of tobacco products in Tampa and Key West is described under those titles. Next in importance are the manufactures of lumber and forest products. The output of lumber, timber, turpentine and rosin exceeds $30,000,000 a year. The next industry in size, the preparation of fertilizers, is much smaller. Florida holds first place in the production of turpentine, pitch and rosin. North Carolina, which once held first place, has fallen to sixth.

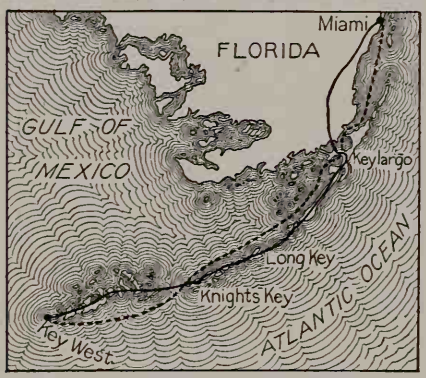
Convicts in prison camps in lumber regions and near phosphate quarries do most of the labor in those two industries, and are hired to the highest bidder. There is no penitentiary in the state, but there are two state prison farms.

Transportation and Commerce. Florida has excellent facilities for transportation, both by land and water, even though there are few harbors of the first class. Intercourse between all of the important cities of the state and with the principal commercial centers of the North is rapid and convenient. The distance from New York to Jacksonville is little more than from Chicago to New York, and from





Chicago to Jacksonville is only 212 miles more. Palm Beach, Florida's most notable winter resort, is forty-eight hours from Chicago and forty-five hours from New York City. Miami is seventy miles south of Palm Beach. Then, running along the eastern coast, the Florida East Coast Railway, which was extended to Key West in 1912, brings the traveler to the extreme south of Florida. Tampa, on the central west coast, is 1,195 miles from New York



THE RAILROAD TO KEY WEST
The solid black line is the route of the railroad; the steamer routes are indicated by the dotted line.

and 1,309 miles from Chicago. Within the state over 4,900 miles of steam railway, about 130 miles of electric railway and 1,000 miles of navigable rivers afford connection with all places of importance or interest. The construction of railways since 1880 has had a most important influence on the prosperity and progress of the state. Since that time the population has increased almost fourfold.

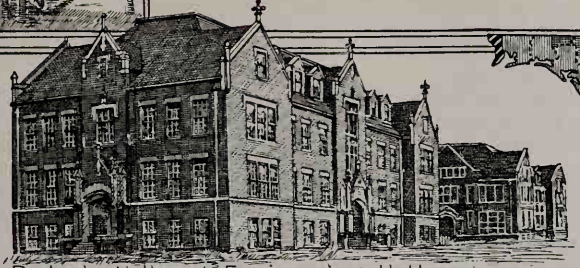
Large trade is carried on through Pensacola harbor, where the channel is thirty feet deep at low tide. Jacksonville harbor has been much improved within recent years. The largest export trade is through Pensacola, Jacksonville and Tampa. Key West, Fernandina, Punta Gorda, Carrabelle, Apalachicola and Saint Augustine are also export centers.

Education and Religion. Education in Florida has not been in a satisfactory state, but a compulsory education law in force since 1915 will remedy this defect. Separate schools are provided for white and colored children. In 1914 about 172,300 pupils were enrolled in nearly 2,700 public elementary schools and about 5,000 pupils in nearly a hundred public high schools.

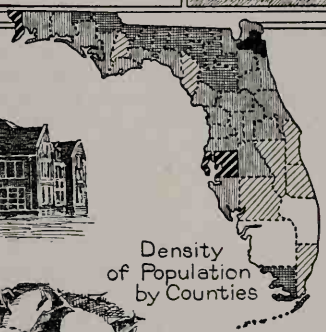
Higher education is provided by the state in a university at Gainesville, a State College for Women at Tallahassee and Rollins College at Winter Park. The John B. Stetson University at De Land is one of the leading private schools of the South.

Over forty-one per cent of the church members of Florida are Baptists, more than thirty-seven per cent are Methodists, and others are chiefly Roman Catholic, Protestant Episcopalians and Presbyterians.

FLORIDA



Peabody Hall and Engineering Hall, State University



Density of Population by Counties

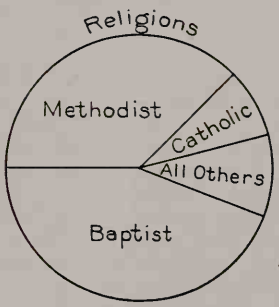
Less than 2
2 to 6
6 to 18
18 to 45
45 to 90
90 and over

Center of Population

Alligators Hatching

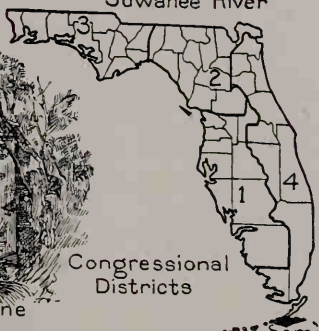
1910	11
1900	9
1890	6.6
1880	4.6
1870	3.2
1860	2.4
1850	1.5
1840	.9
1830	.5

People per square mile by decades



"Way down upon the Suwanee River"

Church at Saint Augustine Built by the Spaniards



Congressional Districts

Present-day Seminole Indian and Bride

Charity. There are thirty-three charitable institutions in the state, among them being schools for the deaf, dumb and blind, the Confederate Soldiers' Home, hospitals and industrial homes. There are also state asylums for the insane, and almshouses. Each county provides its own poor relief.

Government. Florida is governed under a constitution which dates from 1886. The legislature consists of a Senate with thirty-two members chosen for four years, and a House of Representatives of sixty-eight members chosen for two years. The Senate is changed by the election of one-half its membership every two years. Sessions are held every other year and are limited to sixty days.

The governor is elected for four years and is not eligible to succeed himself. A secretary of state, an attorney-general, a comptroller, a superintendent of public instruction and a commissioner of agriculture are the other state officers. Each serves for four years. A supreme court with five justices serving for six years, circuit courts and courts of inferior jurisdiction administer justice. For local government the state is divided into forty-eight counties, each with five commissioners and a sheriff, who, with other county officers, serve for two years.

Payment of poll taxes is a qualification for voting. In 1913 the direct primary was adopted by the state. The legal holidays of Florida are New Year's Day, Robert E. Lee's and Washington's birthdays, Memorial Day, Jefferson Davis's birthday, Independence, Labor and general election days, Thanksgiving and Christmas. Shroye Tuesday is a legal holiday in cities and towns where carnival associations are organized for celebrating that day.

History. From the landing of the Spanish adventurer, Ponce de Leon, at Saint Augustine, April 2, 1513, in search of the fountain of perpetual youth, until 1819, the history of Florida is chiefly one of Spanish exploration and possession. During those 306 years numerous Spanish exploration expeditions met with hardship and failure. The expedition of Narvaez, about 1528, is of interest because only four of his band, headed by Cabeza de Vaca, succeeded in reaching Mexico; that of De Soto, eleven years later, because it resulted in the discovery of the Mississippi River.

In 1562 and 1564 Huguenots (Protestants from France) attempted settlements in Florida on the Saint John's River, but the Spaniards erected a fort at Saint Augustine and massacred the colonists. In 1586, Sir Francis Drake, on one of his plundering expeditions, burned Saint Augustine, but the Spaniards retained their hold on the country and founded Pensacola about 1699. Then English colonists from Carolina and Georgia commenced to enter the territory which Spain regarded as its own, and disputes continued until, by the Treaty of Paris in 1763, which ended the French and Indian War, East and West Florida were ceded to England. (West Florida lay west of the Apalachicola River and included parts of present Alabama and Mississippi.) Twenty years later this territory again became the possession of Spain. After that time conditions in Florida menaced the peace of the southern borders of the United States. It was the refuge of runaway negroes, plundering Indians and dangerous adventurers. Disputes and battles ensued, and in 1819 the United States obtained possession of Florida by treaty. For seven years war was waged with the Seminole Indians, after which they were given lands west of the Mississippi. In 1845 Florida was admitted to the Union as the twenty-sixth state.

In 1861 the state seceded from the Union and joined the Confederacy, but Federal forces easily captured coast towns. In 1864 it was again lost to the Union, but the next year the ordinance of secession was repealed, and in 1868 a new constitution was framed, under which the state was readmitted to the Union. The part played by the state in the Presidential election of 1876 was important, and resulted in the election of Rutherford B. Hayes (see ELECTORAL COMMISSION). Since that time Florida has been generally Democratic.

The reclamation of swamp lands, the discovery of phosphate deposits and the growth of fruit-growing industries have aided the development of Florida and have brought Northern capital and population to the state. The tobacco industry has called people from Cuba. The most notable disasters were the frosts of 1894, 1895, 1899, 1906 and 1917, which destroyed millions of dollars worth of fruit, and the hurricane at Key West in October, 1909, which destroyed property and injured many people. E.D.F.

Other Items of Interest. Sidney Lanier wrote a delightful sketch called *From Morn Till Night on a Florida River,* which describes a trip on the Ocklawaha and makes very real the charm of Florida scenery.

RESEARCH QUESTIONS ON FLORIDA

(An Outline suitable for Florida will be found with the article "State.")

If the lakes of Florida were evenly distributed among the states of the Union, how many would each state have?

Allowing 31½ gallons to a barrel, how many barrels of water does the Silver Spring pour out in one hour?

How does the state manage to obtain a revenue from its convicted criminals?

Who discovered Florida? For what was he searching at the time? What other famous explorers visited the region?

What part did certain tiny sea animals have in determining the coast line and the neighboring island formations of this state?

What enterprise in Saint Petersburg which really has nothing to do with the weather would suffer financially if there were a "run" of cloudy weather?

If the chief manufacturing industry of the state were abandoned, who would miss the product most?

What is Shrove Tuesday? How is it celebrated in Florida and in a number of the other Southern states?

How many states are lower in average elevation? How many states have "highest points" which are less lofty than that of Florida?

Where is there a much-used natural automobile race course?

Of what very useful sea product does this state have practically a monopoly?

How many of the states east of the Mississippi are larger than Florida? How many have a larger population?

How large a proportion of the inhabitants live in the four largest cities?

What effect do the sand reefs along the eastern coast have on the commercial possibilities of the state?

How does Florida help the farms of other states to be more productive?

What is the chief difference between the prairies of Florida and those of the Central and Western states?

Who were the most important Indians of the Peninsula? Tell something of their history. About how many are left in the state?

How does Florida's largest spring rank as to size among the springs of the world? What shows graphically the force with which some of these springs reach the surface?

Is the crop which brings to the state the largest returns a subtropical product, or is it grown in the cooler regions?

What does the name of this state mean? Why was it given? Account for two popular names.

What river, not especially important, is known by name as widely as any of the world's greatest rivers?

How long does it take to go from New York to Florida's most famous winter resort? From Chicago?

To how many nations has the territory comprising Florida belonged?

If the coast line of this state were straightened out, how far westward from New York would it reach?

Of what tropical or semi-tropical products does this state grow practically all that is produced in the United States?

It is estimated that Silver Spring, in Marion County, pours out about 300,000,000 gallons of crystal-clear water daily.

Saint Augustine, founded in 1565, is the oldest town in the United States.

Of the states east of the Mississippi only one, Georgia, is larger than Florida.

Though it has no great heights, Florida is by no means monotonous in its surface features, the central "lake region" especially being diversified with innumerable wooded hills.

Florida has great stretches of "prairie," but at certain seasons this would not be recognized as such, for, unlike the western prairie land, it is occasionally flooded and becomes in effect swamp land.

The forests of the state, according to the latest estimates, cover almost two-thirds of the total area, and no other state in the Union has so many different kinds of trees.

Florida once had large flocks of egrets, but the demand for their beautiful feathers was so great that most of them have been killed.

Related Subjects. The reader who wishes for more detailed information on the subject of Florida will find it in the following articles:

CITIES AND TOWNS

Gainesville	Pensacola
Jacksonville	Saint Augustine
Key West	Saint Petersburg
Miami	Tallahassee
Palm Beach	Tampa

COAST WATERS

Florida, Gulf of	Mexico, Gulf of

INLAND WATERS

Apalachicola River	Okechobee Lake

LEADING PRODUCTS

Alligator Pear	Lemon
Banana	Lime
Cigars	Lumber
Cocoanut	Orange
Corn	Phosphates
Fuller's Earth	Pineapple
Grape Fruit	Rosin
Guava	Sponge
Kumquat	Turpentine

UNCLASSIFIED

Dry Tortugas	Florida Keys
Everglades	Seminole

FLORIDA, GULF OF, also called FLORIDA STRAITS and once known as NEW BAHAMA CHANNEL, comprises the waters which separate Southeast Florida and the Florida Keys from the Bahamas, at the east and Cuba at the south. The Gulf Stream passes through it. It is over 300 miles in length, which equals that of the Delaware River, and in width it varies from sixty to 100 miles. Although the shallow waters of the Great Bahama Bank are included in the eastern half of this gulf, the main channel is about 3,000 feet deep.

FLORIDA, UNIVERSITY OF, a state university for men, established in 1905 at Gainesville by act of legislature. By this same act all the institutions then under state control were merged into two schools, the other being the State College for Women at Tallahassee. The university at Gainesville is organized into the graduate school, the colleges of arts and sciences, agriculture, engineering, law, the teachers' college, the agricultural experiment station and the university extension division. A summer school is maintained, which attracts a large number of students. The income of the institution, amounting to over $100,000 a year, is derived from state appropriations and from various educational funds. Each department of the university has a separate building for carrying out its major work. The total student enrollment is about 650, and there are about sixty professors and instructors.

FLORIDA KEYS, a group of small islands or reefs which stretch in a curved line 200 miles long, from Biscayne Bay southwest into the Gulf of Mexico. They are remarkable examples of coral formation, and most of them are submerged by high tide. They contain numerous good harbors, the most important being the one at Key West. Here is located the town of Key West, which has a naval station, and is connected by steamers with principal eastern coast cities. The railroad from Key West to the mainland, over the water from island to island, a distance of 130 miles, was financed by Henry M. Flagler, and is considered one of the greatest of modern engineering feats. A map of this sea-going extension of the Florida East Coast Railway is shown with the article FLORIDA.

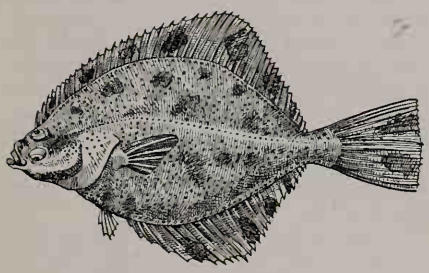
FLOR'IN (pronounced with short *o*), a term derived from the Latin *florem,* meaning *flower,* is the name given to a gold coin which originated in Florence in the thirteenth century. It was so called because it bore on one side the imprint of a lily. Similar coins were soon in circulation all over Europe. The gulden, or florin, was until recently the unit of account in Austria, and was worth about forty cents. The Dutch florin has the same value. The English two-shilling piece, called a florin, is worth about fifty cents.

FLOTOW, *flo'toh,* FRIEDRICH VON (1812-1883), a German operatic composer, best known as the author of *Martha,* which is considered

his greatest work. *Martha* was sung in Vienna in 1847 for the first time. At the age of eighteen he began to devote himself to composition. His first operatic venture was *Peter and Catherine,* which was brought out at Hôtel Castellan, about 1831. He then composed *La Duchesse de Guise,* which was founded on a Polish story and was produced for the benefit of the Polish exiles. *Stradella,* produced in 1837, was his first great success. Besides the operas mentioned, Flotow wrote others, including *L'Ame en Peine, L'Ombre, Il Flor d'Harlam, Enchantress, Indra* and eleven others of lesser note.

FLOT'SAM, JET'SAM AND LI'GAN, English legal terms, the first referring to shipwrecked goods which float; the second, to goods thrown overboard, which sink and are lost; and the third, to goods which sink, but which are tied to a buoy so that they may be recovered. No owner appearing to claim them, goods which are saved are forfeited to the Crown. The American term for shipwrecked goods which are recovered is *salvage.*

FLOUN'DER, an important flatfish, valuable for food, found in the ocean along the shores of almost all countries. The family includes the halibuts, flounders proper and turbots. Young flounders swim erect like other fish, and



THE FLOUNDER

have an eye on each side of the head, but the grown-up flounders swim with one side uppermost and have both eyes on the upper side, one set lower than the other, giving the face a twisted appearance. These fish live in waters where the bottom is smooth, sandy or muddy, but never rocky, and grow very large, some weighing as much as 500 pounds. The upper side of the body is colored much like the sea bottom where the fish lives; the under side is white, or nearly so. See FLATFISH.

FLOUR, the nutritious portion of wheat and other grains, ground and purified. Of the various kinds of flour, that made from wheat is the most valuable and the most widely used, so the word without any qualifying term has come to mean *wheat* flour. Flour from most of the other cereals is named from the grain, as *rye* flour and *barley* flour; that from oats and corn is commonly known as *meal.*

Varieties of Flour. The most common form of wheat flour is the fine meal that is so extensively employed in making white bread. In modern milling six grades are manufactured, and by blending different grades the various commercial flours sold under appropriate trade names are produced. The highest grade, known as *first patent,* makes the whitest bread and loaves of the largest size from a given quantity; the lowest grade, *red dog,* is used chiefly as an animal food.

White flour derives its nutritive qualities mainly from starch, gluten, fat and minerals. Its universal use in bread-making is due to the presence of gluten. This substance, which does not occur in the same form in other cereal flours, gives bread dough its stickiness and toughness, enabling it to retain the bubbles of gas formed by yeast or baking powder and thus giving it the quality of "lightness."

Flour is valued according to its color, freedom from dirt and particles of the outer husks, or bran, capacity of absorbing water, fat content, amount and quality of gluten and degree of fineness; but the final test of any brand of flour is the character of the bread made from it. The most progressive flour mills test their product in experimental bakeries maintained especially for that purpose. Spring wheat, which grows in the summer and is harvested in the autumn, makes better bread than winter wheat, which is sowed in the fall, because it contains a larger proportion of gluten; the latter, however, is superior to spring wheat for pastry. Crackers and macaroni are other important food products of wheat flour.

The consumption of wheat flour increased so rapidly during the nineteenth century that at one time it was feared the demand would outstrip the available wheat supply, but the opening up of great wheat tracts in such regions as the Canadian Northwest has averted that danger. It is estimated that the people of the United States and Canada consume in a year about 200 pounds of flour each, which is equivalent to four and one-half bushels of wheat. Bread, pastry, crackers and other flour preparations constitute about nineteen per cent of the total food of the average family.

Besides the standard white flours, Graham

flour and whole-wheat flour are marketed to a considerable extent. The former, named for Sylvester Graham (1794-1851), an American reformer and advocate of vegetarianism, is unsifted wheat meal ground from the entire kernel. Whole-wheat flour contains all of the kernel except the coarser portions of the bran. The bran itself, constituting the outer coats of the wheat kernel, is now being extensively used to give bulk to food, and as a laxative—it is Nature's remedy for constipation. Graham and whole-wheat flours compare favorably with white flour in composition; in common with bran, which ranks low in nutritive qualities, they are more laxative than fine white flour. Gluten flours, from which nearly all the starch has been eliminated, are considered of value in certain forms of dyspepsia and diabetes.

How Flour Is Made. The modern process of flour milling consists in separating the outer bran layers from the inner portion of the wheat kernel by repeated grindings, and in purifying the broken inner portion (the middlings) until a pure white flour is secured. The wheat is carried to the top of the mill in elevators, and then passed through several machines which remove all particles of dirt, weed seeds, chaff and other impurities, and free the kernels from fuzz and hair. If the kernels are too dry and brittle the bran will split up into tiny pieces and spoil the flour during the reduction process, and so it is often necessary to dampen, soak or steam the wheat in order to moisten the outer layer. When these processes are completed the cleaned wheat is again elevated to the top of the mill, weighed there by automatic machinery and then passed through the various grinding machines, or rollers.

There are usually five sets of rollers, and the passage of the grain through each is known as a *break*. At one stage of the process the germ of the wheat kernel is removed, for that portion contains fat which is liable to become rancid and spoil the flour if permitted to remain. After the first grinding the crushed wheat is separated into (1) first-break flour, (2) middlings, consisting of portions of the inner part of the kernel and of fine pieces of bran, and (3) bran and unbroken wheat. The unbroken wheat is then passed through the next set of rollers, and after the second break is separated as before into flour, middlings and bran. The middlings from each break are subjected to a purifying process, in bolting, sifting and scalping machines, being gradually separated from the bran and other by-products of the wheat, and the purified middlings are finally reduced to a fine white meal, forming the high-grade first-patent flour.

Portions of fine flour yielded by the various breaks, which are more or less mixed with impurities, become the red-dog or low-grade flour, and the impure middlings accumulating during the successive grindings form what is known as *baker's flour*. It is customary, too, to blend the different streams of break flour and middlings flour to form special commercial brands. The finished product is finally fed into a machine which packs it into sacks or barrels. The former hold a half barrel, quarter barrel and eighth barrel, and a barrel contains 196 pounds.

Statistics of the Industry. Minneapolis, Minn., which is in the famous spring-wheat region of the Valley of the Red River of the North, is the most important flour-milling center in the world, and its Pillsbury "A" Mill, which has a capacity of 15,000 barrels every twenty-four hours, is the largest mill anywhere in operation. The combined capacity of the mills of the city is more than 86,000 barrels a day. Other important centers are Kansas City, Mo., Buffalo, New York, Duluth, Saint Louis, Philadelphia, Milwaukee, Chicago, Detroit, Rochester and Cincinnati. There are in the United States about 7,500 manufacturing establishments which supply the home market and also export flour in large quantities, besides numerous smaller mills (gristmills) which grind wheat, corn and other grain provided by neighborhood farms. The value of the annual product of American flouring mills is about $900,000,000. The total output is about 107,000,000 barrels a year.

Canada is also an important flour-manufacturing country, having over 1,140 establishments producing flour and gristmill products. The value of the yearly output is about $82,500,000. The provinces having the largest number of establishments are Ontario and Quebec. Winnipeg, in Manitoba, is one of the leading flour-manufacturing cities of the world; Toronto, Montreal and Vancouver are other important centers. On the outbreak of the War of the Nations in 1914 Canada sent 1,000,000 barrels of flour to Great Britain, a gift that was gratefully received by the British government. The Dominion export trade amounts to nearly 5,000,000 barrels a year.

Budapest, Hungary, is the leading European city engaged in the production of flour. The

important flour-producing countries, in addition to Canada and the United States, are Argentina, Australia, Austria-Hungary, Belgium, British India, Bulgaria, Germany, the Netherlands, Rumania and Russia, but some of these fall far below the United States. M.R.T.

Related Subjects. The reader is referred to the following articles in these volumes:

Bran	Macaroni
Bread	Rye
Corn	Starch
Food	Wheat
Gluten	Yeast

FLOWERS, in the popular sense, are the blooms or blossoms of trees and plants. They are wonderful creations which spring from the dull, dark earth, and appeal with their beauty and sweetness, not only to the eyes and hearts of human beings, but also to birds, butterflies and insects. They are those wonders of nature which, from the time man learned to express his thoughts in written language, have inspired artists and poets. Like human children, these children of Mother Nature bring with them happiness, or peace, or comfort. Mary Howitt says, in her *Use of Flowers:*

God might have made the earth bring forth
Enough for great and small,
The oak tree, and the cedar tree,
Without a flower at all.

Then wherefore, wherefore were they made
All dyed with rainbow light,
All fashioned with supremest grace,
Upspringing day and night?

Our outward life requires them not,
Then wherefore had they birth?
To minister delight to man,
To beautify the earth;

To whisper hope—to comfort man
When his faith is dim;
For whosoever careth for the flowers
Will much more for Him!

Henry Ward Beecher, in his *Discourse of Flowers,* tells that "Flowers have an expression of countenance as have men or animals. Some seem to laugh; some have a sad expression; some are pensive and diffident; others again are plain, honest and upright."

In botany the word *flower* means a branch or shoot which is highly modified for the purpose of insuring the increase of the plant through the production of seed.

Flower Structure. In a typical flower there are four circles, or sections, each specially divided into other parts.

Calyx. The first or outermost circle is the calyx. Its form, that of a cup, suggested the name, which is derived from the Latin *calix,* meaning *cup.* The calyx is leaflike in structure, nearly always green, but sometimes it is the most brightly-colored part of the blossom. Its duty is to protect the more delicate parts within. The separate divisions, or leaves, of the calyx are called sepals (see illustration).

Corolla. The next circle, within the calyx, is the corolla. The word is Latin, and means *little crown.* The corolla of a flower is usually brightly-colored; it is what people usually call the blossom, and to the child it is the whole flower; it is that part of the flower which invites the insects and birds. It also protects still further the very heart of the flower.

Petals. Each leaf of the corolla is called a petal. When the delicate beauty of many corolla-leaves is regarded, it is easy to believe with M. M. Ballou, who writes:

For mine is the old belief,
That midst your sweets and midst your bloom,
There's a soul in every leaf.

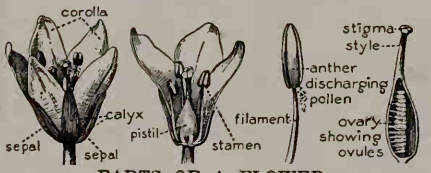
Stamens. Within the corolla is a circle of slender stalks with little knobs at the top. These are called stamens, which is the Latin for *thread,* and they are the male organs of the flower. Their duty is the production of *pollen,* which is described below.

Filament. The threadlike stamen-stem is called the filament. Its only duty is to support the knob at the top.

Anther. The knob at the top of the filament of a stamen is called the *anther.* It usually consists of two lobes, or cells, each with a lengthwise slit. Within these cells is a powder-like substance, generally of a yellow color, which is discharged at a special time in the life of a flower. The word is from the Greek, meaning *flowery,* or *blooming.*

Pollen. The powdery substance contained in the anthers is called *pollen,* a Latin word meaning *fine dust.* Pollen is the fertilizing matter of flowers.

Pollen grains vary greatly in size, shape and markings. Some are dry and very tiny, and sometimes fitted with little wings, so that they are easily carried by the wind. Others are covered with a sticky substance, so that



PARTS OF A FLOWER

they become attached to visiting insects. Some are round; others are angular. Some are smooth; others are rough. The work they do is described under the title POLLEN AND POLLINATION.

Pistil. The innermost organs are called *pistils.* They are so called from their resemblance to the pestle of a mortar, having a small knob at the top and an enlarged portion at the bottom. They are the female, or seed-bearing, organs of the flower.

Ovary and Ovules. The pistils have an enlarged hollow chamber at their base, called the *ovary.* Within that chamber are the undeveloped seeds, and these little eggs are called *ovules.*

Style. Up from the ovary extends the long, tapering portion of the pistil, called the *style,* from the Greek word for *pillar.* It supports a knob called the *stigma.* When pollination has taken place in a flower, pollen tubes grow down through the style to meet and fertilize the ovules in the ovary below.

Stigma. At the tip of the style is the *stigma,* an expanded knoblike or grooved surface. The word *stigma* is from a Greek word meaning *mark,* or *blemish.* When ripe, the stigma secretes a sticky fluid or grows a coating of hairs, by means of which pollen-grains are held to it. These pollen-grains grow down through the style and fertilize the ovules, as explained above. In this way life is brought to a sleeping cell, and a seed is made from which future generations of plants will spring.

In some plants there is no style or stalk, and then the stigma rests directly on the ovary.

Variation in Flowers. Very few flowers are altogether true to the type described above. Often not all of the four circles are present. Either the calyx, or the corolla, or both, may be lacking. Only stamens may be found in one flower, while the pistils may be in another flower on the same plant. Or all the flowers on one plant may have stamens only; that is, they will be the male or pollen-bearing flowers, while those of another plant of the same species may have the pistils only, and be the female, or seed-bearing, flowers. Some flowers have all the petals the same size and same shape; others have a few petals large and the rest very tiny. Some flowers open during the day; others, and those are usually white or of pale colors, open at night.

Every strange form or habit of a flower, however, exists for a definite purpose in the life of that plant. The one big necessary thing in that life is the transferring of pollen from stamen to pistil. It has been proved that those plants grow strongest and best which are from seeds which have had new characteristics brought to them through the pollen from a different flower on the same plant, or from an entirely different plant (see CROSS-FERTILIZATION). So the brilliant colors, the varied and wonderful shapes, the markings, the fragrance and the honey-bearing sacks are all methods of attracting insects or birds to help in Mother Nature's wonderful work of pollination (see BOTANY, subhead *Why Plants Need Insects*). One of the special structures of flowers and pollen-bundles to insure the reproduction of a plant is interestingly shown in the life history of the orchid.

Then, when seeds have finally been made, comes the matter of putting those fertilized ovules into the ground, in n[illegible] surroundings, to start another generation [illegible] plants. That story is so long and inte[illegible]t, it is told farther on in these volume[illegible] the heading SEEDS.

The Yesterday and To-d[illegible]owers. At one time all flowers were [illegible] many of the beautiful varieties aard B[illegible] which are seen to-day did not exist us th[illegible]me in the far-away past some savenance[illegible] perhaps, carried from a woodland smile[illegible] the door of her cave a gaily blo[illegible]ant which pleased her eye. There it hon[illegible] fully nourished and lovingly helped [illegible] struggle for existence, and the culture [illegible] flowers began. Then, down through the centuries simple garden plots grew into stately. well-kept flowerbeds on large estates, for the love of flowers has passed down from generation to generation. From the busy housewife, the care of flowers

FLOWERS, FROM NORTH TO SOUTH

was transferred to special workers. They, in their turn, having time and the desire to experiment and to study, found it possible to create new forms of life by aiding Mother Nature in her work and hastening her processes. The science of raising plants and producing new and improved forms of life has become a life work with many men (see BURBANK, LUTHER).

The raising of plants for commercial purposes has grown into an important industry. Florists, everywhere, supply flowers to those city people who have neither the time, the place nor the means to grow them; and to

CHILDREN SHOULD DELIGHT IN FLOWER CULTURE

those who wish to pay the price, they furnish rare plants, or flowers out of season, which must be carefully grown under glass. There are over 7,400 florists' establishments in the United States, each producing at least $250 worth of flowers a year. The entire output for a year is valued at about $35,000,000; almost 115,000,000 square feet of land are under glass. In all the larger Canadian cities, especially in the eastern provinces, there are establishments of a similar character.

Uses of Flowers. Flowers are not only used to make home sites more beautiful, but they are used for interior decoration, as well. They bring God's beautiful out-of-doors within; they bring comfort and kind thoughts; they have a language for the bride in her wedding garments, and they speak to those bereft of loved ones. As Percival tells us, in *The Language of Flowers:*

In Eastern lands they talk in flowers,
And they tell in a garland their loves and cares;
Each blossom that blooms in their garden bowers,
On its leaves a mystic language bears.

Flowers in Medicine. As the roots, leaves and seeds of many plants are used in medicine, so, too, are a number of flowers used to bring practical relief to the suffering. The flowers of the American linden, or basswood, are collected in May or June, carefully dried in the shade and then sold for about thirty-five cents a pound. A drink brewed from those flowers is used as a remedy for headaches and indigestion, and for breaking up colds.

The corolla-leaves of flowers of the coarse weed mullein, collected when nearly open and then dried, are used to relieve coughs, catarrh and diarrheal complaints. The wholesale price of mullein flowers is listed at seventy to eighty cents a pound.

Both flowers and fruit of the elder are used medicinally. The flowers, if collected when fully open and then quickly dried, contain properties which make them valuable. They are used to produce perspiration and for poultices and ointments in treating rheumatism, sores, burns, etc. Elder flowers bring about eighteen to twenty cents a pound.

Flowers in Perfumes. All plants produce within themselves some special kind of oil which gives forth an odor either pleasing or unpleasant. The use of such oils is to provide the blossoms with those fragrances or scents which attract the creatures which are necessary to the plant's existence (see BOTANY, subhead *Interesting and Curious Plants*). Joubert, in *Thoughts,* expresses the beautiful sentiment that "The odors of flowers are their souls." To preserve those "souls" a little longer, and to bring to us those fragrances which we love when we cannot have the flowers themselves, the great industry of preparing perfumery from flowers has been established.

When we look into the faces of flowers and think of their life histories from seed to seed—lives affected by heredity and environment just as are our own lives—we can understand that sentence from Christina G. Rossetti's *Consider the Lilies of the Field:*

Flowers preach to us if we will hear.

Suggestions for a Flower Garden. The pleasure and satisfaction derived from the planting and rearing of beautiful, fragrant flowers more than offset the sacrifice of time and

Planting-Table for Flowers

Variety	Amount of Seed for 10 Feet of Row	Depth to Plant Seed, Inches	Distance Apart of Rows, Inches	Distance Apart of Plants in Row, Inches	Time to Plant		Height of Plant when Well Grown Inches	Color of Flowers
					Indoors	In Open Ground		
Ageratum	1 pkg.	¼ to ½	12	6	March	May	6 to 9	Blue
Alyssum	1 pkg.	¼ to ½	12	6		May	3 to 6	White
Aster	1 pkg.	½ to ¾	12	9 to 12	March	May	12 to 36	White
Balsam	1 pkg.	½ to ¾	24	24	April	May	24 to 30	Pink
Candytuft	1 pkg.	¼ to ½	12	4 to 6	April	May	6 to 10	White
Cockscomb, low	1 pkg.	¼ to ½	18	12	April	May	12 to 18	Red
Cockscomb, tall	1 pkg.	¼ to ½	24	24	April	May	36	Red
Larkspur, annual	1 pkg.	¼ to ½	12	12	March	May	12 to 18	Blue
Marigold	1 pkg.	¼ to ½	12	6	April	May	6 to 24	Yellow
Mignonette	1 pkg.	¼ to ½	12	12	March	May	12 to 18	Greenish yellow
Nasturtium	1 pkg.	½ to ¾	12	12		May	9 to 12	Red, orange
Pansy	1 pkg.	¼ to ½	12	6	March	April	4	Various
Phlox	1 pkg.	¼ to ½	18	12	March	May	12	Red
Salvia	1 pkg.	¼ to ½	24	18	March	May	24 to 36	Scarlet
Snapdragon	1 pkg.	¼ to ½	12	12	March	May	12 to 36	Yellow
Stock	1 pkg.	¼ to ½	18	12	March	May	12 to 18	Scarlet
Sweet William	1 pkg.	¼ to ½	12	6	March	June	18 to 24	Pink
Verbena	1 pkg.	¼ to ½	18	18	March	May	6 to 8	Blue
Zinnia	1 pkg.	¼ to ½	12	12	April	May	12 to 24	Red

energy necessary for keeping up a garden. School yards, especially, should be made attractive by flower beds. A few general suggestions, applicable for home or school gardening, are here given, including a planting table. It is a good idea to plan the garden before beginning the actual work. Arrange to have the tall plants form a background for those which grow lower; attractive effects may be secured by a careful arrangement of color schemes (refer to table above). See, also, the article Gardening.

The plot selected should be accurately staked out, and should be fertilized with a coating of well-rotted manure. Turn the manure under the soil with a fork or spade, and just before planting give the ground a thorough raking. The plants must be watered when there is a scarcity of rain, and the garden must be kept free from weeds. Good cultivation is essential. This means hoeing the surface of the ground and then dragging a rake lightly over it, so there will be at all times a fine, light layer of soil on the top.

The time of planting, the depth to sow the seeds, and distance between plants and rows are shown in the accompanying table, which applies to the latitude of New York state. Allow ten days later or earlier for every 100 miles north or south of that state. Indoor planting refers to seeds started in the house and transplanted later.

Artificial Flowers

Flowers made by hand are of a great variety of materials, usually in imitation of natural flowers, and are used for scientific as well as for decorative purposes. A collection of glass flowers at Harvard University represents the flora of the United States. Flowers of wax in collections in museums of natural history are strikingly lifelike. The use of artificial flowers for decoration and ornament has resulted in the establishment of an important industry in various countries. At present France and America are the chief centers for the manufacture of flowers for house and table decoration and for adornment of women's apparel. The output from the United States establishments alone is valued at over $9,000,000 yearly.

Artificial flowers have been made since centuries before the Christian Era, and by people of all nations. Although silks, linen, cotton, gauze, satin, velvet, paper, ribbon and kid are the materials now most widely used, the ancient Egyptians used stained horn shavings, and the Romans used gold and silver. The Chinese use rice-paper, the Japanese the pith of bamboo, and in Italy cocoons of the silkworm are dyed and made into flowers. South American Indians utilize feathers for this purpose, and savages of different countries make lovely sprays of flowers from dainty shells.

To make flowers of glass and of wax for scientific purposes requires skill and knowledge of plant life, but the production of many of the realistic artificial flowers of cloth which are sold to-day also calls for art and delicacy. Most of the work is done by hand. First, the various fabrics employed are cut into shapes of leaves, petals, etc., but that is often done by machinery. Then veins are impressed in

leaves by means of dies, and petals are given their hollow form. After that the various parts are assembled by hand and built into the form of a flower, from the center outwards. The flower is then mounted on its stem of wire, and finally the stem is wrapped with tissue paper, silk, or a green rubber tubing. If variations in tint are desired, which must be added with a brush, the leaves and petals are passed to the artist directly from the cutter.

Not only are artificial flowers of to-day copies of natural flowers, but manufacturers have placed on the market what are known as *fancy flowers,* inventions to use up waste pieces, and the demand for these is considerable, although they represent no living species. L.B.

State Flowers

In nearly every state of the United States some flower more prominent locally than others or beloved for sentimental reasons has become popularly recognized as the emblem of the state. In most cases the choice has been emphasized by act of legislature or by vote of the school children. The following is a list of those commonly accepted:

Alabama .....Goldenrod
Alaska .....Forget-me-not
Arizona .....Sequoia Cactus
Arkansas .....Apple Blossom
California .....Golden Poppy (Eschscholtzia)
Colorado .....White and Blue Columbine
Connecticut .....Mountain Laurel
Delaware .....Peach Blossom
Florida .....Orange Blossom
Georgia .....Cherokee Rose
Idaho .....Syringa
Illinois .....Violet
Iowa .....Goldenrod
Kansas .....Sunflower
Kentucky .....Goldenrod
Louisiana .....Magnolia
Maine .....Pine Cone and Tassel
Maryland .....Black-Eyed Susan
Michigan .....Apple Blossom
Minnesota .....Moccasin Flower
Mississippi .....Magnolia
Missouri .....Goldenrod
Montana .....Bitterroot
Nebraska .....Goldenrod
Nevada .....Sagebrush
New Jersey .....Sugar Maple (tree)
New Mexico.....Cactus
New York .....Rose
North Dakota....Goldenrod
Ohio .....Scarlet Carnation
Oklahoma .....Mistletoe
Oregon .....Oregon Grape
Rhode Island....Violet
South Dakota....Anemone
Texas .....Blue Bonnet
Utah .....Sego Lily
Vermont .....Red Clover
Washington .....Rhododendron
West Virginia....Rhododendron
Wisconsin .....Violet
Wyoming .....Gentian

National Flowers

Since earliest times flowers have been adopted as national emblems. As with individuals, so with the people of a nation; some flower has stood in the memory for years, through association with important events, or with religious ceremonies. So what more appropriate to adopt as that nation's symbol than one of nature's wonders?

One of the oldest of national flowers is that of Egypt, a beautiful species of water lily called the lotus. That flower was always connected in the minds of the Egyptians with their gods and with wisdom. India, too, holds the lotus flower sacred, from the belief that Brahma, the Supreme Being in Hindu religion, was born in its bosom, and it became that nation's flower symbol also.

Persia is a land of beautiful roses, and each year a feast of roses is held as long as those flowers bloom; so the rose is the emblem of Persia. The national emblem of Japan is the chrysanthemum, or golden flower, and the country itself is popularly called the "Land of Chrysanthemums." China has chosen the narcissus as its national emblem.

Greece is a land where flowers have always held a position of importance, and there the violet has been chosen as the national emblem. Italy has chosen the white lily, Spain the pomegranate, France the *fleur-de-lis* and Switzerland the rare edelweiss.

The emblem of England, the rose, brings to mind the War of the Roses, at the close of which the Tudor rose was chosen as the nation's symbol. The shamrock holds its place in Irish hearts because Saint Patrick used it to illustrate one of his sermons. A moat filled with thistles saved a fortress in Scotland from Danish invasion in the reign of Malcolm II, and the thistle was adopted as the national emblem, in gratitude for the escape. So on the coat-of-arms of Great Britain, just below the shield, are engraved the rose, the thistle and the shamrock.

The story behind the adoption of the cornflower, or *Kaiserblume,* as the national emblem of Germany, is a very pretty one. When Napoleon's army held Berlin, Louise, the queen-mother of Emperor William I, taking refuge outside the city, comforted her children by weaving for them garlands of cornflowers from the wayside. After that the cornflower was the favorite of William and the German people.

While marching to battle against an English army in A. D. 640, the men of a Welsh army plucked leeks to place in their caps to distinguish themselves from the enemy. They were victorious that day, and the leek was chosen as the emblem of Wales.

Mexico has chosen the nopal cactus, or prickly pear, as its emblem, and Canada, the leaf of the sugar maple, remarkable for its beautiful coloring in autumn. By popular vote, the widely-distributed goldenrod has been adopted as the emblem of the United States, as not yet has tradition made any flower especially significant.

The following is a list of national flower emblems, the countries being arranged in alphabetical order:

Canada	Maple Leaf
China	Narcissus
Egypt	Lotus
England	Rose
France	Fleur-de-lis
Germany	Cornflower
Greece	Violet
India	Lotus
Ireland	Shamrock
Italy	White Lily
Japan	Chrysanthemum
Mexico	Nopal Cactus, or Prickly Pear
Persia	Rose
Scotland	Thistle
Spain	Pomegranate
Switzerland	Edelweiss
United States	Goldenrod
Wales	Leek

Language of Flowers

Bishop Coxe said, in his *The Singing of Birds,*

> Flowers are words
> Which even a babe may understand.

Throughout the years, and in all nations, certain flowers have always signified a certain sentiment, owing to individual properties or special characteristics, as the amaranth for immortality, because it lasts so long; the poppy for forgetfulness, because stupefying opium is made from its seeds; the brier for insult, because of its thorns.

Poets and peoples of all nations have attributed meanings to many flowers, and so originated a custom of expressing one's thoughts and feelings by means of flowers.

Among the Greeks and Romans the language of flowers was in vogue, and all events of interest were represented by flowers or leaves. The olive was the token of peace; the bay was the poet's crown; the myrtle was the crown for beauty, and the oak was the patriot's crown. A laurel wreath marked success and high achievement. Tender messages were conveyed by lovers through beautiful flowers, and to some extent that custom still exists. A single red rose means "I love you"; the moss-rose bud is a confession of love; a white rose signifies happy love.

The following is a list of flowers whose meanings are well established through the poetry and usage of nations:

Amaranth	Immortality
Anemone	Anticipation, Frailty
Apple Blossom	Admiration
Aspen Leaf	Fear
Brier	Insult
Buttercup	Wealth
Camellia	Illness
Calla	Magnificent beauty, Pride
Candytuft	Indifference
Cornflower	Heaven
Cowslip	Youthful beauty
Cypress	Death
Daffodil	Unrequited love
Daisy	Simplicity
Dandelion	Coquetry
Evergreen	Hope
Everlastings	Undying affection
Fern	Forsaken
Five-leafed Clover	Bad luck
Forget-me-not	True love
Four-leafed Clover	Good luck
Foxglove	Insincerity
Gentian	Virgin pride
Geranium	Deceit
Goldenrod	Encouragement
Heather	Loneliness
Heliotrope	Devotion
Hepatica	Anger
Honeysuckle	Fidelity
Hyacinth	Sorrow
Ivy	Trustfulness
Laurel	Fame
Lilac	Fastidiousness
Lily	Majesty, Purity
Lotus	Forgetfulness
Marigold	Contempt
Moss or a dry twig	Old age
Myrtle	Wedded bliss
Narcissus	Vanity
Oak Leaf	Power

Orange Blossom	Marriage
Oxalis	Pangs of regret
Palm Leaf	Conquest
Pansy	Thoughts
Poppy	Oblivion
Rose	Love
Rosemary	Remembrance
Rue	Repentance
Scarlet Geranium	A kiss
Snowdrop	A friend in need
Sting Nettle	Rudeness
Sweet William	Gallantry
Tuberose	Bereavement
Tulip	Boldness
Violet	Modesty
Yellow Rose	Jealousy

Consult Stack's *Wild Flowers That Every Child Should Know;* Morley's *Flowers and Their Friends;* Gibson's *Blossom Host and Insect Guests;* Maeterlinck's *The Intelligence of the Flowers;* Skinner's *Myths and Legends of Flowers, Trees, Fruits and Plants.*

Related Subjects. The following list includes not only the flowers given separate treatment in these volumes, but a number of more general articles which have to do with certain phases of the subject:

Canna	Everlasting Flower
Cardinal Flower	Fleur-de-lis
Carnation	Forget-me-not
Chrysanthemum	Four o'clock
Clematis	Foxglove
Columbine	Fuchsia
Convolvulus	Gardenia
Cosmos	Gentian
Cowslip	Geranium
Crocus	Gladiolus
Cyclamen	Gloxinia
Daffodil	Goldenrod
Dahlia	Harebell
Daisy	Heliotrope
Dandelion	Hepatica
Day Lily	Hibiscus
Dog's-tooth Violet	Hollyhock
Dutchman's Breeches	Honeysuckle
Easter Lily	Hyacinth
Edelweiss	Hydrangea
Adonis	Immortelle
Agrimony	Iris
Amaranth	Jasmine
American Beauty	Jonquil
Anemone	Kaiserblume
Arbutus	Lady's Slipper
Asphodel	Larkspur
Aster	Lilac
Azalea	Lily
Bachelor's Button	Lily of the Valley
Begonia	Lobelia
Bignonia	Lotus
Bitterroot	Marigold
Black-eyed Susan	May Apple
Bleeding Heart	Mignonette
Bluebell	Moccasin Flower
Bridal Wreath	Moonflower
Buttercup	Morning-glory
Calla	Narcissus
Camellia	Nasturtium
Campanula	Oleander
Candytuft	Orchid
Oxeye Daisy	Sweet Alyssum
Pansy	Sweet Pea
Passion Flower	Sweet William
Peony	Tiger Lily
Petunia	Trillium
Phlox	Trumpet Flower
Pink	Tuberose
Poinsettia	Tulip
Poppy	Verbena
Primrose	Violet
Rhododendron	Wall Flower
Rose	Water Lily
Sunflower	Zinnia

GENERAL

Amaryllis Family	Herbarium
Botany	Herbs
Bud	Inflorescence
Bulb	Leguminous Plants
Catkin	Perfume
Composite Family	Plant
Cross-Fertilization	Pollen and Pollination
Exotic	Rose Family
Flora	Seeds
Greenhouse	Spurge Family

FLOYD, *floid,* JOHN BUCHANAN (1807-1863), an American statesman and Confederate soldier in the War of Secession. He was graduated from South Carolina College in 1826, practiced law in Virginia and in Arkansas, and was governor of Virginia from 1846 to 1852. In March, 1857, he became Secretary of War in President Buchanan's Cabinet, but his lack of administrative ability soon became apparent. In December, 1860, Floyd was discovered honoring heavy drafts made by government contractors in anticipation of future earnings, and the President requested his resignation.

In February, 1862, he became commander of the Confederate forces at Fort Donelson, and on the night of February 18 he fled, with his second in command, General Pillow, leaving General Simon B. Buckner to surrender to General Grant. Two weeks later he was relieved of his command by President Davis, and died at Abingdon, Va., during the next year.

FLUORESCENCE, *floo o res' ence,* a property possessed by certain substances by virtue of which they send back to the eye rays of light of a different color from that of the rays falling upon them. The name was taken from the mineral *fluor spar,* many violet and green varieties of which exhibit this property in a marked degree. A fluorescent substance absorbs a part of the light which falls upon it, modifies it to a great extent, and then radiates it again; the modification consists in increasing the wave-length of the light which strikes the body.

This phenomenon was discovered by Sir David Brewster in 1833, in the course of his

experiments with light. He admitted a beam of sunlight through a lens into a solution of chlorophyll, which is the green coloring matter of plants, and discovered that the path of the rays within the solution was marked by a bright red light, though blue, yellow and orange were absorbed. Similarly, he found if a beam of sunlight falls upon a solution of sulphate of quinine the portions of the surface where the light strikes show a bright blue color. Canary glass, which is glass colored with oxide of uranium, also possesses this property, and when illuminated its surface exhibits a beautiful yellowish-green. In each case the fluorescent light corresponds to a wave-length longer than that of the colors absorbed by the substance. Nearly all kinds of paraffin oil and solutions made from the bark of the horse chestnut are highly fluorescent.

When the source of illumination is removed, most fluorescent substances cease to give off light. There are some, however, such as diamonds, calcium tungstate and the sulphides of barium, calcium and strontium, which glow for some time in darkness. Such bodies are called phosphorescent.

Related Subjects. The reader is referred to the following articles in these volumes:

Color	Light
Fluor Spar	Phosphorescence

FLUORINE, *floo'o rin,* an element which enters into the composition of the very abundant mineral known as fluor spar, which is a combination of fluorine with calcium. Small quantities of combined fluorine are also found in bones, in the enamel of the teeth and in the blood. Fluorine is never found in a free state in nature, because it is the most active element chemically and enters easily into combination with other elements. Fluorine was isolated for the first time in 1886 by the French chemist Henry Moissan (1852-1907), who decomposed hydrofluoric acid by electricity.

Fluorine belongs to the group known as the halogens (which see). It is a greenish-yellow gas, with a sharp odor, and it is just a little heavier than air. It can be liquefied when subjected to high pressure and low temperature. Fluorine does not burn in air, which means that it does not combine with oxygen, but most metals burn in it, forming *fluorides.* Hydrogen, sulphur, phosphorus and carbon take fire when put into a vessel containing fluorine. Water is decomposed by fluorine at ordinary temperatures, on account of the great attraction it has for hydrogen, with which it forms hydrofluoric acid (which see). The chemical symbol for fluorine is F. See CHEMISTRY.

FLUOR SPAR, *floo'or spahr,* the mineral used for etching glass. It is a compound of oxygen, fluorine and calcium, and occurs in beautiful cubelike crystals, which may be blue, yellow, green or red, but the blue are the most common.

To write your name on glass with fluor spar, place some powdered fluor spar and sulphuric acid in a lead dish. Coat a piece of glass with wax, then write your name in the wax with some sharp-pointed instrument, such as a brad-awl. Place the glass wax side down on the dish and slightly warm the mixture. In a few minutes the acid set free will etch the name in the glass. See FLUORESCENCE.

FLUTE, in music, a term applied to a wind instrument, usually made of wood and consisting of a pipe pierced with holes. In the same class are the fife, flageolet and piccolo, all described in these volumes. Sound is pro-

FLUTE

duced by a current of air entering the tube. The ancient Hebrew and Greek forms were held away from the player, who blew through a mouthpiece at the end. The modern flute is played by blowing through a mouthpiece in the side. The tube is about twenty-seven inches long, and may be made of boxwood, ivory, ebony or silver, with mountings to suit individual taste. In a modern orchestra the flutes have an important and most effective part. Usually there are two, and when, in loud and strong passages, a third is required, it is generally the piccolo that is used. This is a small flute, with a high, shrill tone, a little unpleasant to some people.

FLUX, *fluks,* a word derived from the Latin *fluere,* meaning *to flow,* and now applied scientifically to any substance added to ore before melting, as an aid in separating impurities from the metal. In iron smelting, the flux generally used is limestone, which readily combines with the undesirable properties in the ore and forms a slag which may be easily removed from the molten iron. Fluxes consisting of mixtures of borax, soda and potash are used to separate base metals from gold and silver. In assaying silver, litharge and red lead are used, as they quickly dissolve metallic oxides. The proportion of flux required can only be decided by experiment, as ores vary considerably.

FLY. "A fly," wrote a small boy who had had a lesson in school on the harm the little pest can do, "is more dangerous than a lion, but I would rather have a fly bite me than a lion." Not many years ago flies were looked upon as a necessary nuisance; they were troublesome, but they were not dangerous, people thought, and there was no possible way of getting rid of them. A half-century ago it was common at mealtime during the summer months to have a servant or one of the children of the family stationed near the table with a leafy branch, wherewith to wave away the flies which were thick in the dining-room. A little later nettings were introduced, and then came wire screens, to keep out as many as possible; but to-day such measures are looked upon as all too passive, because the deadly nature of the insect is understood, and regular crusades are instituted against the fly.

But why? What can this little insect do that makes it as "dangerous as a lion," and has caused "Swat the fly" to become a slogan? Before discussing this question it is necessary to learn something about the insect.

What a Fly Is. The name *fly* is applied to many different kinds of insects; in fact, more than 40,000 species are known to-day, but they all have certain traits in common. The most noticeable of several resemblances is the fact that they have but two wings; the scientific name for flies is *Diptera,* which means *two-winged.* No other known insect has two wings except one little scale-insect. The wings of flies are always transparent, never folded as are the wings of grasshoppers, and they have prominent lengthwise veins. Instead of hind wings most flies have two small, rod-like organs which probably help the insect to balance and steer itself in flight. The head of a fly is usually small; by far the larger part of it is made up of two wonderful eyes, which are often composed of thousands of facets which enable their owner to see in almost any direction. A few species are provided with sucking mouth-parts, but fortunately the common house fly is not thus equipped.

The Commonest Fly. Of the true flies, a number of groups are very well known, as the *gnats, blow flies, midges* and *mosquitoes;* and the name is often applied to certain insects to which it does not really belong, as the *dragon fly* and the *May fly.* But there is one true fly which is so common all about the haunts of man that it has received the name of *domestic fly,* or *house fly,* and it is this little creature which is meant when the term *fly* is used without modification.

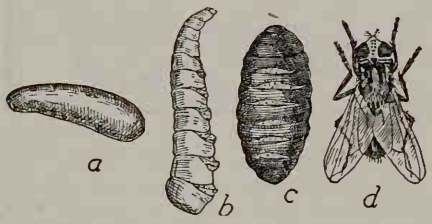
Life History. There are some very interesting things about the house fly. Every child has watched with wonder its progress across the ceiling, to which it is held by the sucker-like hairs on its feet; but nothing about it is

EGGS OF A FLY
Greatly enlarged.

more remarkable than the amazing rapidity with which it breeds. If there were alive in the world at the beginning of April but one fly, and that an egg-laying female, there might be six months later, if all the eggs laid came to maturity, no fewer than 131,220,000,000,000,000,000 flies—over 131 quintillions of descendants of that one first fly! What wonder is it that a neighborhood which seemed free from flies may in a week or two be swarming with them!

The female lays her eggs in any warm, damp, decaying matter, whether it be the manure of a stable, the filth of a pig's pen or the fermenting garbage; and there the little white maggots are hatched out. Soon these change

into *pupae* (plural of *pupa*, the intermediate state), and in from eight to fourteen days emerge as mature flies. Led by its strong sense of smell, the young fly hastens from its



DEVELOPMENT OF A FLY
(*a*) Egg; (*b*) larva; (*c*) pupa; (*d*) mature insect.

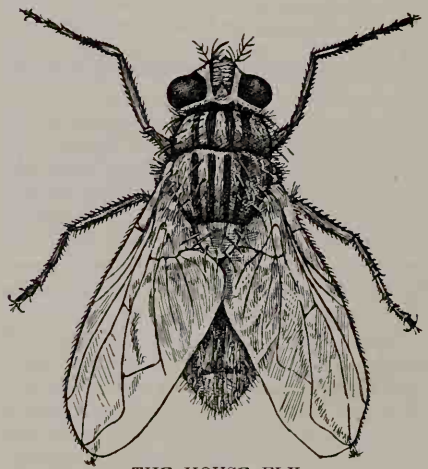
filthy hatching place to the nearest food-supply spot—perhaps an imperfectly screened kitchen or the baby's milk, where it begins to be indeed a deadly enemy.

Harm Done by Flies. Occasionally some person objects that the fly is receiving more than its share of censure, claiming that a little stingless insect cannot be one of the most dangerous things in the world; but doctors and scientists are ready with facts to prove the contrary. It is no longer a theory but a well-established fact that flies cause many of the cases of typhoid; that "summer complaint" might well be called "fly complaint," so clearly is it spread by flies; that tuberculosis and all filth diseases are carried by it; that domestic animals owe many of their diseases to its agency—in fact, that flies cost in Canada and the United States hundreds of millions of dollars and scores of thousands of lives every year.

How they accomplish all this is very evident, since their hairy legs are peculiarly well fitted for carrying germs and filth particles from their favorite breeding-haunts to food often left exposed for them to walk upon. More than 6,000,000 bacteria, it has been estimated, can be carried by one fly on its body as it flies from the manure pile or the spittoon or the sick room to the baby's lips or to the sugar bowl. It is not chance that the fly season coincides with the season of dangerous intestinal diseases and, very largely, with the typhoid season; it is a clear case of cause and effect.

Facing the Fly Problem. The average person feels helpless and hopeless in facing the question of what is to be done about it. "There always have been flies, therefore there always will be flies," is his opinion, despite any little efforts on his part. Serious, scientific men have faced the problem in a sober-minded, scientific manner, and have found ways and means which, if generally adopted, would do much toward ridding the world of this pest. In agricultural communities, such favorable breeding-grounds as manure heaps and open swill barrels can be replaced by covered manure bins and screened-top barrels, and the flies be kept down; cities and villages, however, may, with proper care, be flyless.

Some of the remedies are easy to apply and have been employed for many years. Windows and doors may be screened and "sticky fly-paper" may be placed to catch those which do slip in; but this is not beginning at the source. First of all, the fight must be carried out-of-doors. "Why not," asked a thirteen-year-old boy, who had become interested in the extermination of flies, "put all the flies in jail and



THE HOUSE FLY
Greatly enlarged.

let ourselves out?" The annual cost of screening windows and doors, estimated for the United States and Canada at $15,000,000, would, if properly expended, make screens unnecessary.

Preventive Methods. The first step in a definite campaign is to kill the winter fly—the occasional specimen that survives in a sheltered place and in the spring crawls out to bask and gain strength in the sunshine. Kill it without pity—it may be that thereby the world is being rid of countless millions of summer flies. Until these winter flies have obtained abundant food they cannot lay eggs, and as they are extremely hungry they are easier to

OUTLINE AND QUESTIONS ON THE FLY

Outline

I. Parts of the Fly

(1) Wings
  (a) Only insect except one which has two wings
  (b) Distinguishing marks of wings
    1. Transparent
    2. Not folded
    3. Lengthwise veins
(2) Rodlike "steering" organs
(3) Head
  (a) Large compound eyes
  (b) Mouth parts

II. The House Fly

(1) One of 40,000 species
(2) Rapid breeding
(3) Life history
  (a) Eggs laid in warm, damp place
  (b) The maggots
  (c) Pupae
  (d) Full-grown flies
(4) Danger from flies
  (a) Filthy breeding places
  (b) Diseases carried
    1. "Summer complaint"
    2. Typhoid
    3. Tuberculosis
    4. Filth diseases
  (c) Loss in money and lives because of flies

III. Campaign Against Flies

(1) Old, inadequate methods
  (a) "Shooing" the flies
  (b) Screening
(2) The modern crusade
  (a) Prevention
    1. Killing the winter fly
    2. Cleaning up breeding places
    3. Family work and community work
  (b) The active fight
    1. Fly traps near feeding places
    2. Fly traps outside screen doors
    3. Method of making an effective trap

Questions

Why is it possible for a fly to walk across the ceiling without falling?

What is the significance of the question "Why not put all the flies in jail and let ourselves out?"

Why should the opening in a fly trap be at the bottom rather than at the top?

Name two "flies" that are not really flies.

Why is it not possible for agricultural communities to free themselves of flies as completely as can cities or villages?

How old must a fly be before it can lay eggs? What significance has this in the fight against the fly?

What was the ordinary method of dealing with flies in dining-rooms a half-century ago?

What is the first act of a fly on emerging from the pupa stage?

Why is it unwise to spend sympathy on the surviving winter fly?

Is a campaign for the total extermination of flies in a community practicable?

Give two slogans of the anti-fly crusade.

Why is it possible for a neighborhood to be practically free from flies, and two weeks later to be swarming with them?

What ailment, especially dangerous to children, might well be called "fly complaint," and why?

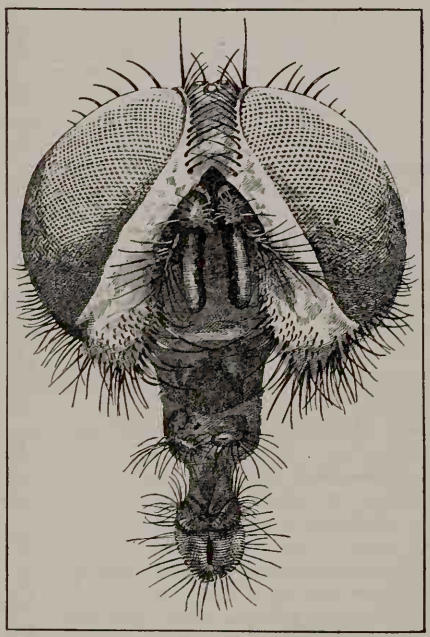
Why cannot one family protect itself against flies without any community effort?

What peculiarity of a fly is its scientific name based on?

What fits this insect particularly for carrying bacteria? How many is it estimated that it can carry at one time?

catch in traps than at almost any other time. If every family in a community would in the early spring days get rid of every fly about the premises there would be no summer campaign, and noonday meals could be eaten on unscreened porches with pleasure and with safety.

Next, breeding-places should be done away with, so far as possible, by providing proper sanitation and by banishing all unnecessary garbage and rubbish. Refuse should be buried or covered with kerosene and burned. Outside slop barrels should be scalded, and in communities where domestic animals are raised care should be taken to have them and the premises kept in a sanitary condition. Much of this work can be done by families in and about their homes; much remains to be done by the public authorities, who can best be urged to a proper conception of their task by enlightened public opinion. Indeed, it may be said that only as community feeling is aroused

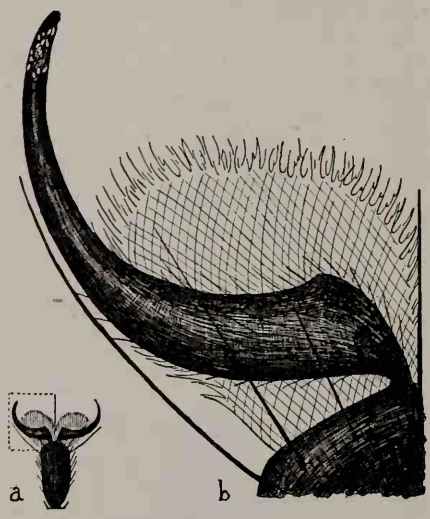


ENLARGED HEAD OF A FLY, FRONT VIEW

The two large areas studded with thousands of lenses are compound eyes. There are three simple eyes at the top, in the center; the fly can therefore see in every direction.

can really effective work be done, for what good does it do a family to rid its own home of flies so long as the meat it gets from the market and the butter and milk it gets from the dairies are contaminated by their presence?

The Active Fight. If the work of prevention by means of killing winter flies and destroying breeding-places is begun early enough, it is all-sufficient; but even if a few flies have been allowed to reproduce themselves and their descendants in their turn have been allowed to breed, the fight is not yet hopeless, though it is rendered more difficult.



THE FOOT OF A FLY

(*a*) Lower joints of the foot, one hundred sixty times actual size.

(*b*) The part of (*a*) shown within the dotted area, magnified 1,500 times its actual size. The deadly typhoid bacilli are shown on the tip. The drawing is reproduced from a photograph.

It remains but to catch the flies as soon as possible after they have emerged, before they have reached the egg-laying stage; for it is well to remember at every stage of the campaign that the fly must feed for two weeks before it can lay its first eggs. And these young flies should be caught out-of-doors, before they have had time to carry filth germs into the house. Somewhere near every house, whether it be in the city or in the country, there is a garbage pail—the flies' favorite feeding-ground. Now if, as they swarm about this, they can be coaxed by some especially attractive bait into a trap which stands above the garbage pail, the work is done, in large measure. Then if another trap be placed outside the screen door, and another in the stable window or barnyard, it is not likely that many

flies would feed through the whole two weeks without getting caught. The "catch" may be quickly killed by immersion in boiling water, or by fumigation with sulphur. Humane methods should be employed, even with flies.

Traps may be bought at a reasonable price, or they may be constructed at home still more cheaply. Any box or other receptacle of transparent material, provided with a crack at the bottom and baited with banana peel, sugar and vinegar, meat or other food attractive to flies, will serve the purpose. One point must be borne in mind—the crack at the bottom must not be too wide, or the flies will crawl out after they have fed and then proceed to lay their eggs. The crack should never be more than a quarter of an inch in width and should open *up* toward the bait and not down, as flies show a strong tendency to crawl upward toward the light.

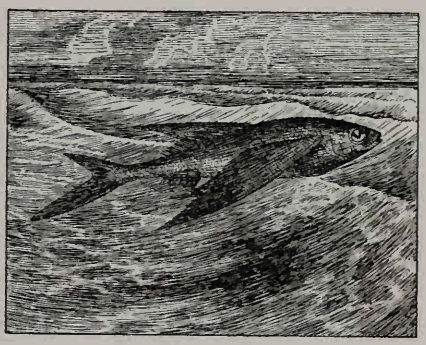
Summary. It may sound at first somewhat visionary—this campaign which has as its aim to "get the last one"—but it has been proved to be sane and practical. Small towns have rid themselves almost completely of the pests; big cities have done such effective work that in the huge public markets no more than half a dozen flies may be found at one time; and neighborhoods have won for themselves relief from the nuisance when other parts of the city have swarmed with flies. These insects do not travel great distances, and a neighborhood campaign will be effective even though the town as a whole does not take up the work. It *can* be done—that much is certain; but it *will* be done only when the people are convinced of the absolute necessity. When a housewife begins to feel that it is a disgrace, a sure sign of untidiness and careless housekeeping to have even one fly about; when the storekeeper or dairyman is made to realize that he is looked upon as a spreader of disease if he does not protect his products; when a community really appreciates the fact that not only unpleasantness but sickness and death result from the presence of flies—then, and not till then, the campaign will be undertaken in earnest. The United States Department of Agriculture has shown an active interest in the problem and has for distribution bulletins which discuss the fly in all its phases, suggesting effective means of combating the danger the fly creates. W.A.E.

Consult Cragin's *Our Insect Friends and Foes*; Comstock's *Insect Life*; Ross's *The Reduction of Domestic Flies*.

FLYCATCHER, a large family of songless, perching birds including about 400 species which are most abundant in the tropics, although thirty species live in the United States. They received their name from the fact that, sitting on a favorable perch, they watch intently for passing insects and dart at them, clicking their bills as they catch their victims. They rarely miss seizing their prey, and as the insects serve as their main food they are forced to migrate in search of them, the phoebe being the only eastern species to winter in the United States. The Acadian flycatcher, wood pewee, crested flycatcher and kingbird belong in this family, but the so-called Old World flycatchers belong to another group.

FLYING DUTCHMAN. In popular legend, a sea captain to whom was meted out a peculiar punishment. He swore, during a violent storm, that he would round the Cape of Good Hope if it took him until the Judgment Day, and in punishment he was forced to sail those seas in a phantom ship forever and ever.

FLYING FISH, an interesting fish which, to escape attacks of other fish, has the power of keeping itself in the air for a short time by means of large fins. In all warm seas flying fish are found, and in the air they look like



FLYING FISH

giant dragon flies. The North Atlantic flying fish is among the best-known species; it was so named because first known in that ocean, but now it is common in all tropical seas. Great schools of these fish greet vessels near the Hawaiian Islands. The *great flying fish,* measuring eighteen inches in length, is found near California, and being a good food fish is caught by the thousands in the vicinity of Santa Barbara. The *sharp-nosed* flying fish is found around Central America.

FLYING MACHINE, man's dream through many ages, made a reality in the present century by the invention of the heavier-than-air device and the development of the balloon from a bubble drifting with the winds to a true airship.

Faith and Unbelief. It is a matter of record that when Wilbur and Orville Wright, the brothers who in 1903 made the first successful flier, announced to their family their intention to build a heavy machine which would fly in the air, their father took immediate steps to discourage so foolish an idea. He wrote to a professor in a great university, outlining the "crazy proposition" and asking him whether he believed it could be done. This professor in his reply declared a man-made flier to be a physical impossibility, and Mr. Wright handed the letter to his sons with the remark, "I told you so."

But the sons had faith in their idea, and they continued their experiments patiently and unceasingly, meeting and overcoming, one by one, the innumerable obstacles which blocked their progress. When at last their machine was tried out in the presence of army officers at Fort Myer, Va., when it soared into the air, obedient to the will of the driver and came lightly to earth again at a spot previously designated, they wired their father, "We told you so."

Why Aeroplanes Fly. The Wright brothers did not discover the principles of flying any more than Watt discovered the power of steam. What they did, like Watt and nearly all other inventors, was to devise a mechanism for utilizing principles already known.

The basic idea of a flying machine is simple enough—it flies for the same reason a kite flies. When you close a door, the slanting surface of the latch is met by a metal guard, and though the pressure of the guard against the latch is outward, the latch retreats at right angles into the door. This is because the pressure of the guard acts perpendicularly to the surface of the latch, and (as the article COMPOSITION OF FORCES explains) such a pressure has the same effect as would two forces, one merely pressing the latch against the side of its casing and the other moving it inward. In a kite the pressure of the wind corresponds to the pressure of the metal guard upon the latch; the force of gravity corresponds to the resistance of the spring behind the latch; the kite string corresponds roughly to the casing. If the wind is strong its upward thrust (that is, the upward element of the pressure perpendicular to the kite's surface) will overcome the force of gravity; if not, the boy who flies the kite may increase the pressure by running against the wind.

In an aeroplane there is no restraining string, and the machine can move forward. The effect of so doing is exactly that of the boy running with the kite; it produces air pressure

FLYING MACHINES

(*a*) A British biplane; (*b*) an all-steel battle plane; (*c*) a Bleriot monoplane.

against the slanting under surface of the machine, and if the engines propel the aeroplane fast enough this pressure overcomes the force of gravity and the machine soars into the air.

The Pioneers. Not all men of the nineteenth century were like the professor to whom the elder Mr. Wright submitted his question. Those who understood the principle of the kite realized that flying machines could be made if engines could be built capable of driving them at high speed, and if means could be discovered to control their equilibrium and the direction of their flight.

Speed is necessary to an aeroplane because in general the pressure of the air beneath it is proportionate to the square of the velocity,

From painting by Lieutenant Henri Farre, artist and aviator, in French Premier Groupe d'Escadrille de Bombardment. Reproduced by courtesy of the artist for THE WORLD BOOK.

AVIATION FIELD AT NIGHT. Return of a night bombarding machine. A small dynamo gives light for powerful searchlights, which serve as a guide for returning machines and are visible on a clear night nearly forty miles.

and a machine traveling twenty-five miles an hour has only one-fourth the lifting power of one moving fifty miles an hour. In order to propel their machines at high speed early inventors had to use heavy steam engines and carry heavy loads of fuel and water. If they doubled the size of their wings to double their lifting power, they had to increase the strength, and hence the weight, of their engines. As a result few of their machines ever left the ground.

But even had the pioneer students of flying possessed the light gasoline engines of to-day they could not have succeeded without working out the problems of how to leave the ground and how to preserve the balance of the machine while in flight.

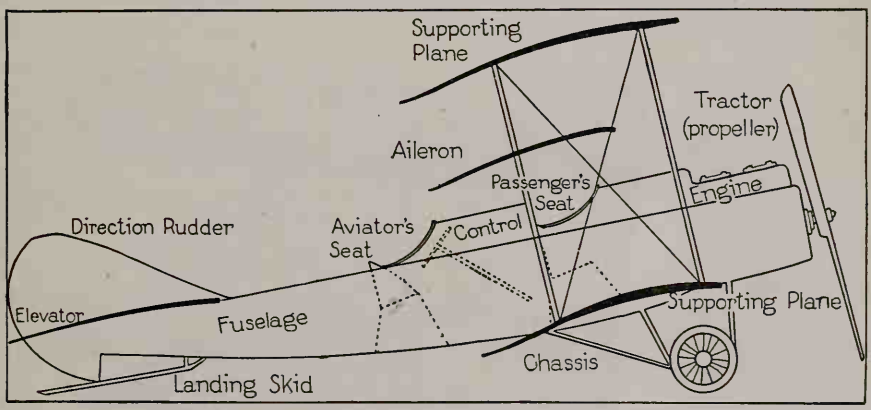


DIAGRAM OF A BIPLANE

To one who sees how easily an aeroplane of the present day mounts into the air after a few seconds run on its rubber tired wheels it seems strange that elaborate starting devices were at first deemed necessary. In 1903, shortly before the Wright brothers' first secret flight, Professor Samuel P. Langley of the Smithsonian Institution completed his "aerodrome," a machine shaped like a dragon fly, for the construction of which the United States government had appropriated $50,000. To launch it he built an inclined track above the Potomac River, and in the two trials of the machine the complicated starting apparatus wrecked it before it could free itself. Glenn Curtiss took the same aerodrome out of the Smithsonian Institution in 1914, placed it on floats so that it could start from the water, added a few braces and gave the engine a new carburetor and radiator, and in spite of an increase of forty per cent in its weight the aerodrome made a number of successful flights. See Langley, Samuel Pierpont; Curtiss, Glenn Hammond.

Langley never knew that he had solved the problem of equilibrium during flight, but he was the only man who did solve it before the Wrights. A Frenchman, Clément Ader, flew a hundred fifty feet in 1890 and three hundred feet in 1897, but as he traversed this distance in less than five seconds, his performance ought to be called a leap rather than a flight. Two men who at that time saw that balance was the vital thing to be learned were Lilienthal, a German, and Chanute, an American. Lilienthal began in 1891 to experiment with *gliders*, aeroplanes without engines, and by leaping from the top of a hill in the face of the wind he made more than 2,000 flights, one of 1,200 feet. Lilienthal balanced his machine by his own acrobatic movements, but Chanute, the longest of whose thousand flights was one of 360 feet, believed in adjustable planes.

Man Triumphs. It was in 1900 that Wilbur and Orville Wright began their experiments. So quietly did they work, down among the North Carolina sands, or near their home in Ohio, that four years after their first successful flight a year-book stated that "the mere fact and but little description has ever been recorded." In France, Santos-Dumont in 1906 flew 655 feet and Farman in 1907 covered 2,530 feet, yet the Wrights, who had stopped experiments in 1905 to give attention to their patents, were content with modestly announcing that in that year they had flown twenty-four miles! In their first secret flight, in 1903, they

had traveled 852 feet, just nine days after the last spectacular failure of Langley's aerodrome.

In 1908 the world awoke to the realization that human flying was not, after all, a physical impossibility. The progress that has been made in the short space since then is astounding. It can best be shown by the following lists of record performances:

LONGEST FLIGHT WITHOUT STOP

		Time	Distance
1903	Wilbur Wright	59 sec.	852 feet
1904	Wilbur Wright	5 min. 4 sec.	3 miles
1905	Wilbur Wright	38 min.	24 miles
1908	Wilbur Wright	2 hrs. 20 min. 23 sec.	95 miles
1909	Henri Farman	4 hrs. 17 min. 53 sec.	144 miles
1910	Maurice Tabuteau	7 hrs. 48 min.	365 miles
1911	Alexandre Fourney	11 hrs. 1 min. 29 sec.	(447 miles)
	M. Gobé		460 miles
1912	A. Fourney	13 hrs. 22 min.	(628 miles)
1913	A. Seguin		634 miles
1914	Reinhold Boehm	24 hrs. 12 min.	1,350 miles

LONGEST AEROPLANE JOURNEY

1910	Louis Paulhan, London-Manchester, 185 miles
1911	Calbraith P. Rodgers, New York-Long Beach, 4,029 miles

HEIGHT IN FEET

1908	Wilbur Wright ..... about 360
1909	Louis Paulhan 1,900-2,000
1910	Arch Hoxsey 11,474
1911	Roland Garros 13,943
1912	Roland Garros 19,032
1913	Georges Legagneux 20,668
1914	Heinrich Oelrichs 26,246

MILES PER HOUR

1909	Leon Delagrange		50
1910	Alfred Leblanc		67
1911	E. Nieuport		83
1912	Jules Vedrines		108
1913	Maurice Prevost		125

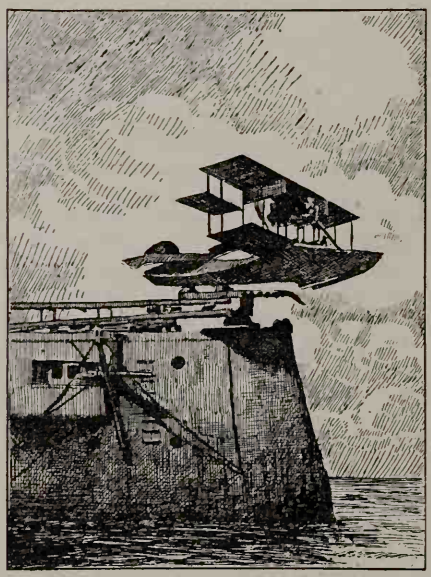
PASSENGERS CARRIED

1908	1	1912	5
1909	2	1913	6
1911	4	1914	20

All of these records were made before the War of the Nations, and without doubt some of them were exceeded in the course of that struggle, in which aeroplanes proved their efficiency both as scouts and as fighters. The progress of aviation was shown in another way in 1913, when the Frenchman Pégoud startled the world by flying upside down and "looping the loop" in the air. This he did in a monoplane, but he soon had many successful imitators in both biplanes and monoplanes.

Aeroplane Types. Until 1916 all the successful flying machines were either *biplanes* or *monoplanes,* but in that year several *triplanes* were employed in the War of the Nations, and one was constructed at the Curtiss factory, in the United States. A *biplane,* as its name indicates, has two parallel planes, which are smooth surfaces of cloth stretched over light, strong frames. A *monoplane* has but one plane, a *triplane,* three. Monoplanes have proved speedier than biplanes and are favorites in Europe, but biplanes are claimed by Americans to be steadier and more reliable.

Wright machines are biplanes. Like those of all aeroplanes since Lilienthal's, their planes are arched from front to back to gain the greatest lifting power with the least resistance to forward progress. The longest edge of each plane is the one which "bites" the air.



BIPLANE ON A BATTLESHIP

Device for launching an airship from the deck of a war vessel.

The distinctive feature of the Wrights' invention is their method of maintaining *lateral stability,* that is, of preventing the machine from tipping to one side or the other. If a gust

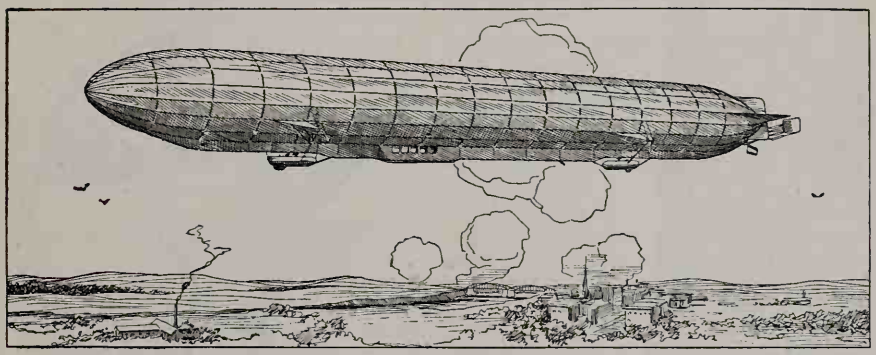
of wind lifts one end of the biplane, they *warp,* or bend, the other end to increase its angle with the ground, and as a result, its lifting power. The machine is turned from right to left, like a boat, by a vertical rudder, and it is made to climb or descend by a horizontal rudder, called the *elevator.* Before 1910 the elevator in Wright machines was in front.

Glenn Curtiss, whose first biplane was built in 1908, invented a substitute for the Wright wing-warping method of maintaining side-to-side balance. His machines are equipped with *ailerons,* or winglets, which are simply horizontal rudders set between the two planes, one at each side.

Monoplanes are the most birdlike of all flying machines. In a biplane the planes usually seem to be the main part, and the elevator and rudders only attachments. In a monoplane, on the other hand, there is a well-defined body, called the *fuselage,* extending from front to back, and the single plane on each side resembles a bird's wing. All monoplanes are tractors; that is, their propellers are in front and pull rather than push. Their stability is secured exactly as is that of biplanes. In recent years tractor biplanes have come into favor, and when built with a solid fuselage, they resemble monoplanes.

Comfort and Safety. There is less reason now to predict that aeroplanes will never come into every-day use than there was at the beginning of the century to assert that man would never fly at all. European aviators early demonstrated that if mounted on wheels flying machines could rise in the air from any reasonably smooth ground without the aid of special launching apparatus, and Curtiss, following in the steps of others, has made flying boats equally serviceable in this respect. The Sperry automatic pilot and similar devices now take from the airman the responsibility of maintaining the stability of his machine in the varying currents of air and leave him little to do but steer. In the larger machines the mechanic may walk about inspecting and adjusting his engines, and the passengers are comfortably seated in a cockpit, or in a cabin.

Dirigible Balloons. Back in the eighteenth century, when men first ascended in balloons, they thought they could row their air-boats. They quickly abandoned this idea, for the very lightness of a balloon in proportion to the surface exposed puts it at the mercy of every current of air. But in 1852 Henri Giffard equipped a cigar-shaped balloon with a very light steam engine and succeeded in attaining a speed of nearly seven miles an hour. Since then dirigible, or direct-able, balloons have steadily increased in speed, strength and dirigibility, and now are able to travel long distances and stem heavy winds.



A 500-FOOT ZEPPELIN IN THE AIR

There are two distinct types of dirigibles, the *rigid* and the *non-rigid.* There is also a *semi-rigid* type, which, as its name indicates, is a compromise. The most famous of all airships, the German *Zeppelins,* are rigid, and their inventor, Count Zeppelin, is the originator of the type. The gas bag of a Zeppelin is stretched over a strong frame of aluminum, and inside of it there are partitions of aluminum which divide it into gas-tight compartments, any one of which may be punctured without causing the airship to fall. The necessities of the War of the Nations brought great improvements and enlargements in the Zeppelins. By the close of 1916 these huge ships were 500 feet in length, and nearly fifty feet

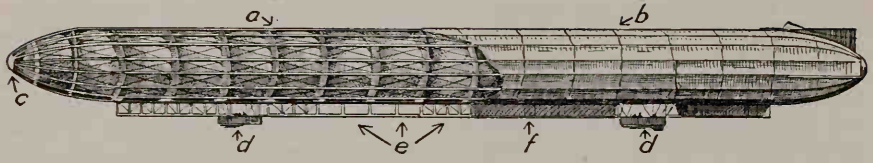


DIAGRAM OF A ZEPPELIN

(*a*) Nine sections showing aluminum girder work under outer fabric cover, and nine of the seventeen chambers, with a hydrogen gas bag in each. (*b*) Outer fabric cover, concealing the other eight gas chambers. (*c*) Solid prow, from which the girders radiate. (*d*) Car, so constructed that it will float on water. (*e*) Opened part of the passageway between the cars; the entire passageway is always covered, as in (*f*).

in diameter. The gas bags of such a model contain 742,000 cubic feet of hydrogen gas. This gas is so much lighter than air that that amount will lift about twenty-one tons of weight into the air. The entire ship and fittings weigh about fifteen tons, therefore the Zeppelins can carry several tons in crew, fuel and supplies.

A non-rigid dirigible has no framework to maintain its shape; if its gas contracts, air is pumped into a number of small internal balloons. The principal advantage claimed for the non-rigid type by its greatest advocate, the German Major Parseval, is that when not inflated it can be folded up and transported from place to place. Before the War of the Nations a French non-rigid, the *Adjutant Vincenot,* held the record for the length of a single voyage, having been thirty-five hours and twenty minutes in the air.

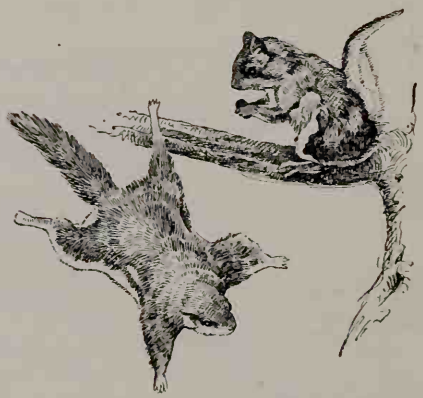
During the War of the Nations a number of combination dirigibles and aeroplanes were successfully flown. They were much smaller than the true dirigibles, which are usually a few hundred feet in length. A.C.

Consult Berriman's *Aviation:* Curtiss and Post's *Curtiss's Aviation Book;* Maxim's *Artificial and Natural Flight.*

Related Subjects. The reader is referred to the following articles in these volumes:

Balloon	Langley, Samuel Pierpont
Curtiss, Glenn Hammond	Wright, Orville and Wilbur

FLYING SQUIRREL, a small squirrel whose name suggests power of flight similar to that of the birds. However, it does not possess ability to fly. It has a fold of skin along each side of its body, connected with its legs, enabling it to make long, flying leaps through the air, its flight sometimes extending as far as sixty feet, but always in a downward direction. It is nocturnal in its habits, that is, it is abroad at night, and it is easily tamed. It so closely resembles in color the decayed tree trunks in which it makes its home that it is almost invisible. It feeds on nuts, leaf buds, birds' eggs and sometimes on young birds. The smaller species are common to North America and Europe. The common flying squirrel found in



FLYING SQUIRRELS

the Eastern United States is six to seven inches long, exclusive of the tail, has extremely soft fur, which is of little commercial value, and soft black eyes. The larger flying squirrel, or *taguan,* is found in Indian and east Indian regions, and is sometimes called the *flying marmot,* or *flying cat.* See SQUIRREL.

FOG, or MIST. When a cloud is formed at so low a level that it rests on the ground or on the surface of the sea, it is known as *fog,* but when it presents only a faint cloudiness it is called *mist.* Fogs often appear at sea when the cold winds from icebergs blow across a warm region where the atmosphere is filled with moisture; the manner in which they form under such conditions is explained in the article HUMIDITY. A warm wind blowing into a cold atmosphere will form fog, and many of the fog banks and cloud banks so common off

the coast of Newfoundland are formed in this way. No fog will appear until the cold air has absorbed as much vapor as it can hold. It forms sometimes suddenly; the hot steam coming out of a kettle shows how rapidly the moisture in warm air is condensed when it reaches much cooler air. In seasons of the year when there is considerable difference in temperature during different hours of the day fogs are most frequent; this is seen in mountain valleys, where they are formed by the cooling of the lower air at night but usually disappear in the morning sunshine. The disagreeable odor of heavy fog in large cities is due to smoke and the many impure gases which it collects. See CLOUD.

Fog Signals are warnings issued to vessels by means of sound when, owing to the presence of fog, other signals would be invisible. Many kinds of signals are used, including horns, whistles, bells and guns. By means of these devices, agreed upon at the International Marine Conference held at Washington in 1890, vessels that are completely hidden from sight in the fog may enable other vessels to locate their positions and avoid the risk of collision. Lighthouses are equipped with fog signals for use when the light is obscured.

The most powerful fog signal is a large steam siren (see SIREN, for illustration). The sound issues from a long iron horn swung on a pivot, which makes it possible to turn it in any required direction. Under favorable conditions the sound of a very large siren may be heard at a distance of thirty miles. Fog signals generally used on railways consist of bombs or torpedoes attached to the rails and exploded by the engine as it passes over them.

Consult *United States Monthly Weather Review*, January, 1914, for an excellent discussion of the subject.

FOCH, *fawsh,* FERDINAND (1851-), a French general who was a distinguished leader from the first days of the War of the Nations (which see). He was conceded to be the greatest military strategist of the allied countries, and in April, 1918, was made generalissimo, or supreme commander, of the British, French, Portuguese, Italian and American forces in France. Until that time there had been no unity of command.

General Foch was born in the Pyrenees Mountains, near the birthplace of the great Marshal Joffre. He was a lieutenant in the French army at the age of nineteen and saw service in the Franco-German War. It was his strategy which helped Joffre to win the Battle of the Marne (which see). Because of his position in that battle as commander of the army of the North he was called the "Protector of the English Channel."

FOLK'LORE, a fascinating study which concerns itself not with learned volumes and the thoughts of scholars, but with the traditions, customs, superstitions, games, songs and proverbial sayings of the great mass of common people. In Europe it centers around peasant life. The further back these things date, and the more thoroughly unspoiled they are by any hint of book lore, the more does the folklore student revel in them. If he can find in some peasant family a quaint saying, a jingle or a nickname that has been handed down by word of mouth generation after generation, he feels that he has unearthed a treasure as surely as does the archaeological collector who discovers a rare specimen. Many of these treasures have given infinite pleasure to people who have no thought or knowledge of folklore, for the Mother Goose rhymes, the old ballads, Grimm's fairy stories and many of Andersen's, and such famous tales as *Cinderella* and *Red Riding-Hood,* were all possessions of the people long years before they were collected and put into book form.

The students of folklore make their discoveries serve a good purpose. For instance, if there is found to be a close similarity in the myths or traditions of two widely-separated peoples, the student may conclude that either there was communication between them at some time in the past, or similar conditions among them have called forth similar explanations or sayings. Sociology, ethnology, history, mythology and comparative religion all profit by the study of folklore, and matters apparently very trivial may serve to indicate principles of considerable value.

Consult Hazlitt's *Faiths and Folklore; a Dictionary of National Beliefs;* Mabie's *Folk Tales Every Child Should Know.*

FOND DU LAC, *fon doo lak',* WIS., the county seat of Fond du Lac County, situated near the southeastern part of the state, at the southern extremity of Lake Winnebago, at the point where it receives the waters of the Fond du Lac River. Appleton is thirty-seven miles north, Milwaukee is sixty-three miles southeast, and Madison is eighty-nine miles southwest. The Chicago & North Western; the Chicago, Minneapolis & Saint Paul, and the Minneapolis, Saint Paul & Sault Sainte Marie

railways enter the city, and electric lines extend through the Fox River Valley north to Green Bay. The first settlement was made by French and Germans in 1836; it was incorporated as a village in 1847, and a city charter was granted in 1852. In 1914 the commission form of government was adopted. In 1910 the population was 18,797; it increased to 21,113 by 1916. The area is six square miles.

Fond du Lac is a busy manufacturing city, about 7,000 people being employed in its eighty factories; the largest of these make church furniture, caskets, leather and refrigerators, butter and cheese. Its bank, school and church buildings excel those of the average city of its size. Besides these it has a Federal building, a $100,000 courthouse, a $55,000 theater, an armory, an imposing high school building, a Masonic Temple, a Y. M. C. A. building, Saint Agnes Hospital, the state insane asylum and the state women's reformatory. In addition to its public and parochial schools it has Grafton Hall (Episcopal), Saint Mary's Academy (Catholic) and a Carnegie Library. Fond du Lac is the seat of an Episcopal bishopric. F.M.G.

FONTAINEBLEAU, *fon tan blo'*, a town in France, thirty-five miles southeast of Paris. It is chiefly celebrated for its chateau, which is rich in historic interest and one of the most magnificent in France. Its apartments were lavishly decorated under different reigns since that of Francis I, and still preserve much of their original character. The forest surrounding the chateau comprises 42,500 acres, and is world-famous. Fontainebleau was the scene of the abdication of Napoleon in 1814; the revocation of the Edict of Nantes was signed here in 1685, as was the peace preliminary agreement between Great Britain, France, Spain and Portugal in 1762. The town figures prominently in many historic romances, notably those of Dumas.

FOO-CHOW. See Fu-Chow.

FOOD. Whatever is taken into the system to supply nourishment, maintain the temperature of the body, furnish energy and provide material for growth is *food*. The body contains about twenty different elements, or simple substances, the twelve most important being carbon, hydrogen, oxygen, nitrogen, sodium, potassium, calcium, magnesium, chlorine, phosphorus, sulphur and iron. These elements are united into hundreds of different compound substances, all of which are indispensable to the healthy working of the system. To maintain these substances in the body in proper proportions food must be supplied at fairly regular intervals, in suitable quantities (neither too little nor too great) and of sufficient variety.

Work of the Body. Careful investigations have shown that there is a loss from the body of a man of average size of about nine pounds of matter every twenty-four hours, not including the undigested portion of food, which is thrown off as waste. Of this nine pounds, seven and a half are water, but the other one and a half pounds were solid matter in the body, although they are eliminated from the body either as gas or in solution in water. The heat given off by the body during this period is sufficient to raise the temperature of fifty pounds of water from the freezing to the boiling point, or to heat its own weight of water from the freezing point to the body-temperature. To produce this heat the body consumes this one and a half pounds of solid matter by a process resembling that of burning the food. Although the body does not become nearly as hot as a furnace, the food materials combine with oxygen from the air—as they do in burning—and yield carbon dioxide, water and salts, the same products, or at least approximately the same, that they yield when burned.

Chemistry of Foods. Foods contain the same elements as are found in the body, otherwise they could be of little or no value; in other words, what we call food would not be food at all. We must first of all, then, look for nitrogen, hydrogen, oxygen and carbon, since these elements enter into the composition of the body in larger proportions than any others. Next in importance come calcium and phosphorus, which are found in large proportions in the bones, and finally iron, a small proportion of which is required in the blood.

According to their composition the chief substances contained in foods are generally divided into the following classes:

Proteins. In the first class are those containing nitrogen as one of their elements. This class takes the name *protein,* which means *of first importance.* Such foods as lean meat, cheese, milk, eggs, nuts and peas and beans are rich in proteins. The dry white of egg is nearly all protein and so is the gummy *gluten,* which we have left when we chew wheat for a long time, or when we wash dough under running water until all the starch has been carried away. Proteins are the most important

food substances, since they nourish the muscular tissues. During every moment of life the protein supply of the body is being drawn upon, and unless this supply is adequately replenished from the food, the body loses weight and grows weak.

Carbohydrates. The second class includes those which contain carbon, hydrogen and oxygen, with the latter two in the same proportions as in water. This class is represented by starch and sugar, which are known as *carbohydrates*

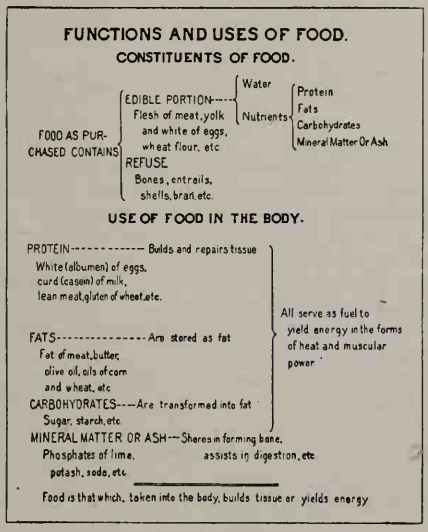


DIAGRAM OF FUNCTIONS AND USES OF FOOD

The above chart is published by the United States Department of Agriculture, size 17x22, suitable for hanging in a schoolroom.

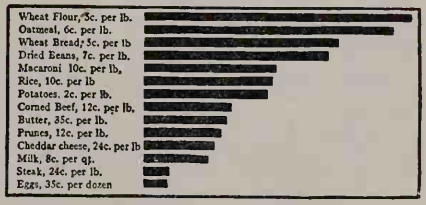
(from *carbon* and the Greek *hudor,* meaning *water*). The carbohydrates are obtained from vegetables, with the exception of milk-sugar, which is made from milk. Wheat flour, potatoes, carrots and beets owe their value as foods largely to the carbohydrates they contain. So also do all the common fruits, such as apples, oranges and grapes.

Fats. The third class includes those substances which contain *hydrogen* and *carbon,* with a smaller proportion of oxygen than the carbohydrates. These are known as *fats.* Lard, butter and olive oil are good examples. Fat meat, egg-yolk, nuts and some classes of fish, such as salmon, shad and eels, contain a large proportion of fats. The chief purpose of these foods is to furnish fuel. For this purpose they are much more valuable than the foods of the other classes, one pound of fat yielding two and one-fourth times as much heat as one pound of protein or carbohydrate. They are more difficult to digest than the starches and sugars, and give the best results when mingled with a certain proportion of these foods. See FAT.

Inorganic Substances. The fourth class includes all the inorganic substances used as food; that is to say, all the substances which do not contain the element carbon. With the exception of water, which forms about six-tenths of the weight of the body, and common salt, which we add to our food, we get the inorganic substances in sufficiently large quantities in the ordinary articles of food of a well-balanced diet to supply the demands of the body.

Water. The amount of water or "moisture" contained in foods varies greatly. Thus, sugar and olive oil contain no water; wheat flour contains about twelve per cent; bread, about thirty-five per cent; average of beef, about sixty per cent; grapes, seventy-seven per cent; potatoes, seventy-eight per cent; turnips, ninety per cent; watermelon, ninety-two per cent, and tomatoes and celery nearly ninety-five per cent. One cannot make an accurate estimate of the amount of water in a food by merely looking at it or feeling it. Who would suspect that flour contains any moisture or that turnips have more than potatoes or grapes? It is only by actual drying and weighing that we can find out how much of any food is water and how much is solid matter.

Refuse. As bought in the market, most articles of food contain parts that are not or cannot be eaten, such as the bone and gristle in meat, the skins of vegetables and seeds of fruits. These parts are refuse, or waste, the proportion of which should receive careful consideration in the purchase of food.



THE FOOD VALUE IN TEN CENTS

Food as Fuel. The fuel value of food is measured by a heat unit called the *calorie* (which see). A calorie is the amount of heat required to raise the temperature of a kilogram

of water one degree centigrade; this is practically the amount necessary to heat one pound of water four degrees Fahrenheit. Careful experiments have determined the fuel values of the different classes of foods to be as follows:

Protein, 4 calories per gram, or 1,820 calories per pound.

Fats, 9 calories per gram, or 4,040 calories per pound.

Carbohydrates, 4 calories per gram, or 1,820 calories per pound.

All nutritious foods are fairly good fuels, but not nearly so good as pure fats. One can readily see why people living in a temperate climate eat more fat in winter than in summer, why the Eskimo drinks his blubber with relish, and why people of the tropics eat little or no fat.

Digestibility of Food. "We live not upon what we eat, but upon what we digest." Food must undergo a number of chemical changes before it becomes suitable to nourish the body. Digestibility is an important consideration in selecting food. This means not only the ease with which a given article of food is digested, but also the amount of nutriment it will yield. The time required for digestion depends upon the class of food, the quantity and the condition of the stomach. The following table, based upon investigations made by the United States Department of Agriculture, published in *Bulletin 142,* contains valuable information concerning various articles of food ordinarily used in a mixed diet:

KIND OF FOOD	PROTEIN		FAT		CARBOHYDRATES	
	Digestibility	Fuel value per pound	Digestibility	Fuel value per pound	Digestibility	Fuel value per pound
	Per cent	*Calories*	*Per cent*	*Calories*	*Per cent*	*Calories*
Meats and fish	97	1,940	95	4,040	98	1,730
Eggs	97	1,980	95	4,090	98	1,730
Dairy products	97	1,940	95	3,990	98	1,730
Animal food (of mixed diet)	97	1,940	95	4,050	98	1,730
Cereals	85	1,750	90	3,800	98	1,860
Legumes (dried)	78	1,570	90	3,800	97	1,840
Sugars	.....	.....	.....	.....	98	1,750
Starches	.....	.....	.....	.....	98	1,860
Vegetables	83	1,410	90	3,800	95	1,800
Fruits	85	1,520	90	3,800	90	1,630
Vegetable foods (of mixed diet)	84	1,840	90	3,800	97	1,820
Total food (of mixed diet)	92	1,820	95	4,050	97	1,820

Mixed Diet. From the foregoing statements it can readily be seen that while man may live on an exclusively vegetable diet or an exclusively meat diet, he will preserve his health and maintain his strength much better on a mixed diet. All the organs and tissues of the body contain proteins; proteins are the only substances that can supply nitrogen, and comparatively few vegetable foods are rich in proteins. Nine-tenths of the fat in an ordinary diet is supplied by animal foods, and about nine-tenths of the starch and sugar by vegetable foods. Since small quantities of mineral matter are found in all foods, a mixed diet supplies the body's needs.

Quantity of Food. The quantity of food needed depends upon a number of conditions. These are:

Sex. Men, being larger and more active than women, require more food. The average woman eats about four-fifths as much as the average man.

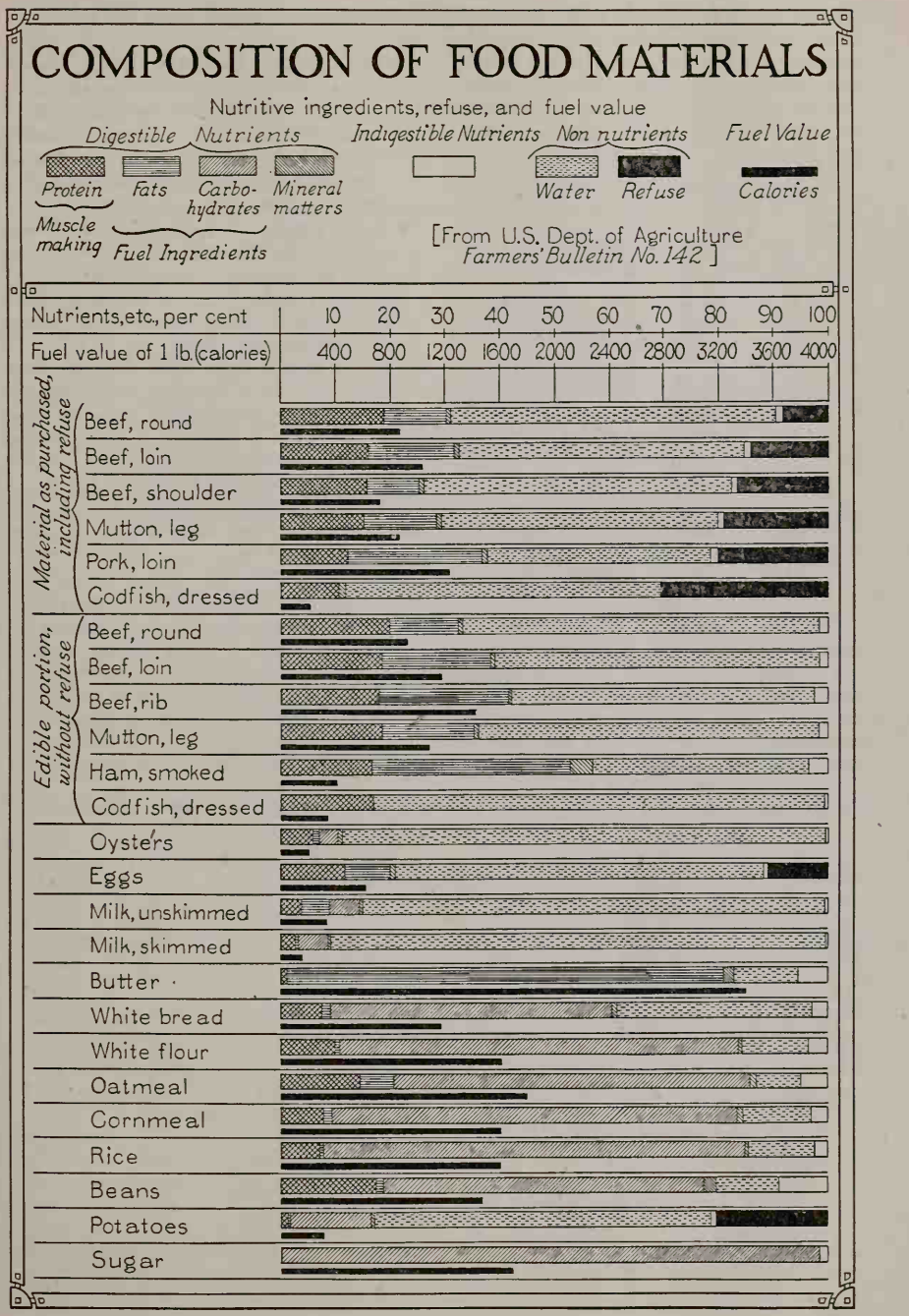
Age. A growing child requires proportionately more food than an adult. Boys and girls over fourteen eat nearly as much as adults of the same sex. An aged person requires less food than one in middle life. After the age of sixty the diet may be reduced about one-tenth for every ten years of age.

Occupation. A man engaged in manual labor in the open air, as a lumberman or stonecutter, for instance, requires more food than a clerk or one working at a desk.

Climate. People living in cold climates require more food than those living in temperate and tropical climates. People in temperate climates require more food in winter than in summer.

Planning Meals. With such a knowledge of foods as is here outlined, the housewife can plan meals so as to meet the physiological needs of her family, give a good variety of

COMPOSITION OF FOOD MATERIALS



appetizing food and prevent waste. She should always bear in mind that that food is the cheapest which supplies the greatest amount of nutriment at the lowest cost. The following estimate prepared by the United States Department of Agriculture will be found a safe guide:

Man at hard muscular work requires 1.2 times the food of a man at moderately active muscular work.

Man with light muscular work, and boy 15-16 years old, require 0.9 the food of a man at moderately active muscular work.

Man at sedentary occupation, woman at moderately active work, boy 13-14, and girl 15-16 years old, require 0.8 the food of a man at moderately active muscular work.

Woman at light work, boy 12, and girl 13-14 years old, require 0.7 the food of a man at moderately active muscular work.

Boy 10-11 and girl 10-12 years old require 0.6 the food of a man at moderately active muscular work.

Child 6-9 years old requires 0.5 the food of a man at moderately active muscular work.

Child 2-5 years old requires 0.4 the food of a man at moderately active muscular work.

Child under 2 years old requires 0.3 the food of a man at moderately active muscular work.

The following table, prepared by the Illinois Food Commission, is of value in determining the relative cost of various articles of food. A quart of milk is taken as the standard. While the prices may vary from those here given, the relative value as compared with milk will remain practically the same:

KIND OF FOOD	COST	NUMBER OR MEASURE	WEIGHT GRAMS	WEIGHT Lb.	WEIGHT Oz.	TOTAL COST
Milk	$0.08 per Qt.	1 Qt.	976	2	2	$0.08
Cheese (1)	0.22 " Lb.	.....	193.3	.....	6.8	0.093
Eggs	0.35 " Doz.	10	566	1	3.9	0.29
Meat (2)	0.22 " Lb.	.....	307.7	.....	10.8	0.148
Codfish (3)	0.15 " Lb.	.....	428.5	.....	15.1	0.141
Potatoes (4)	1.00 " Bu.	7	722.7	1	9.4	0.026
Bread (5)	.....	.....	188.6	.....	6.6	0.025
Cornmeal	0.03 " Lb.	.....	137.7	.....	4.9	0.009
Cabbage	0.025 " Lb.	1 Head	1875	4	2.2	0.10
Dried Beans	0.06 " Lb.	.....	143	.....	5.05	0.018
Oranges	0.40 " Lb.	8	1304.4	2	14.0	0.226
Apples	0.60 " Pk.	12	1052.6	2	5.1	0.092
Bananas	0.20 " Doz.	5	774	1	11.3	0.10
Prunes	0.15 " Lb.	.....	187.5	.....	6.62	0.061
Nuts	0.60 " Lb.	.....	128.7	.....	4.5	0.163

1. Full Cream Cheese. 2. Meat—Fat, Round Beef. 3. Codfish—Boneless.
4. Potatoes—60 Lb. to Bushel. 5. Bread—White.

Popular Errors. There are a few common errors concerning food values which need attention, since following them often leads to unnecessary expense or more serious consequences.

Meat Extracts. Manufacturers and dealers in meat extracts advertise them as having a high nutritive value, whereas the best authorities state that they have no nutritive value whatever, but that their value lies wholly in their effectiveness as stimulants and appetizers. "In brief," says one of these authorities, "beef-tea is the poker, nutriment is fuel; and heat can no more be obtained from a poker than the body can be nourished on ordinary extract of meat or beef-tea." A cup of hot bouillon on a cold day is a good stimulant, but it does not take the place of a steak.

Cuts of Meat. Many think that the more expensive the cut of meat the more nutritious it is, when often the contrary is true. To illustrate, the flank of beef has a much higher nutritive value than the loin, which usually costs twice as much. Moreover, when the cheaper cut is properly cooked it is equally palatable. The food value of veal is about one-half that of beef.

Delicacies. The food value of brains, kidneys, livers, oysters, lobsters and clams is low, while some of them are difficult to digest.

Bread and Meat. Meat usually supplies more fat, and consequently more fuel, than bread, but the total food value of bread per pound is equal to or greater than that of most cuts of meat.

Breakfast Foods, etc. Manufacturers and dealers rate the various cereal preparations far above their actual nutritive value. To illustrate, a preparation of wheat may contain no

more nutriment than wheat or graham flour, but it is sold for two or three times the price of the flour. While these foods are pleasant, they are not economical.

The full page table accompanying this article, prepared by the United States Department of Agriculture and published in *Bulletin 142,* is valuable for reference.

Consult Carpenter's *Food and Their Uses;* Chamberlin's *How We Are Fed;* United States Department of Agriculture *Bulletin 142.*

Related Subjects. The following articles contain much information bearing on this very important subject. Many of the topics, as FISH, FRUITS, GRAINS, MEAT, VEGETABLES, have themselves lists of related topics, to which the reader is referred, so that the range of reading here indicated is a wide one.

Adulteration
Albumen
Baking Powder
Benzoate of Soda
Blanc-mange
Boys' and Girls' Clubs
Bread
Breakfast Foods
Butter
Calorie
Candy
Canning Clubs
Carbohydrates
Casein
Caviar
Cheese
Chile-con-carne
Chocolate
Cocoa
Coffee
Cold Storage
Cookery
Copra
Diet
Digestion
Edible Bird's Nest
Egg
Fat
Fireless Cooker
Fish (see list)
Flour
Food Products, Preservation of
Fruits (see list)
Gelatin
Glucose
Gluten
Grains (see list)
Honey
Irish Moss
Jelly
Ketchup
Lard
Macaroni
Meat (see list)
Molasses
Nutrition
Oleomargarine
Paprika
Peptones
Pemmican
Pickles
Proteids
Proteins
Pure Food Laws
Raisins
Saccharin
Salt
Spice
Starch
Sugar
Tapioca
Tea
Vegetables (see list)
Vinegar
Water
Yeast

FOOD PRODUCTS, PRESERVATION OF. The annual production of food in the United States is sufficient to feed twice the population of the whole American continent. The areas of production, however, are frequently far distant from the center of population, and the distribution of foodstuffs, especially of perishable products, such as fruits and vegetables, is a serious problem. Large quantities of such foods are shipped by rail in refrigerator cars, but the cost of transporting them in this manner is very great, and the price demanded of the consumer is correspondingly high. Some fruits and vegetables are placed in cold storage, but this, too, is expensive, and the foods so preserved become luxuries. A few fruits are dried, but they are not so palatable as the fresh fruits, and the demand for them is light. It is evident, then, that these methods of preservation take care of only a small part of the annual production and do very little toward distributing it among the population and preserving it for out-of-season use.

The great bulk of perishable food produced is sealed in cans and so shipped to any distance and kept for any period of time without danger of deterioration. During the year 1916 over 300,000,000 cans of food were preserved in commercial canneries, and according to a conservative estimate, 150,000,000 quarts were canned in homes. Canned food is cheaper than cold storage food and has more nearly the flavor of the fresh product than has food that is dried. Any food product exposed to the air decomposes. This decomposition is caused by small organisms, visible only through the most powerful microscope, which grow and multiply in it. *Freezing,* as applied in cold storage plants, arrests the activities of these organisms; *drying* retards their development in some products; *heat,* properly applied, kills them.

Methods of Canning. There are four methods of canning now in general use: (1) The hot pack, or open-kettle, method; (2) the fractional, or three-day, method; (3) the cold water method; (4) the cold-pack method.

The *hot-pack,* or *open-kettle, method* has been in use in homes for years. The food is boiled or sterilized in one kettle, the jars, caps and rubbers, in another. Then the sterilized food is ladled into the sterilized jars and the jars are sealed. This method is only partially successful, because frequently a spore or organism from the air is ladled into the jar with the food, and decomposition results.

The *three-day,* or *fractional, method,* often called the *laboratory method,* is based on a knowledge of the development of spores and organisms. Scientists have discovered that boiling temperature will kill organisms, but that a considerable period of boiling temperature is required to destroy spores. By the three-day method the food is boiled in the jar on the first day to destroy organisms, on the second day to destroy organisms developed from spores not destroyed by the first boiling,

and on the third day to sterilize any organisms that were slow in developing. This method has never come into general use, for several reasons. It involves a great amount of labor, requires a great quantity of fuel, and destroys jar rubbers, which are not made to withstand so many boilings.

The *cold-water process* is practicable only for fruits high in acid, such as gooseberries, rhubarb and cranberries. Its application is so limited and its results so uncertain that it is little used. It consists simply in packing the fruit into a jar, filling the jar to overflowing with cold, sterilized water and sealing.

The *cold-pack method* has been in use by commercial canners for years, but it has only recently been made available for housewives and boys and girls engaged in garden and canning club work. This method is safe, certain and economical for home canning of food products.

The most common type of container used in the work is the Mason type of glass jar. This jar has a zinc or aluminum screw top, with a rubber ring that fits between the glass and the top; the rubber makes the container air-tight when the top is screwed tight on the jar. The glass top jar permits no food to come in contact with metal, and is considered a little more sanitary than the zinc top container. A rubber ring is fitted between the glass top and the jar, and a clamp spring is provided that may be tightened as soon as sterilization is complete.

The Economy, or vacuum, jar has a metal top coated with gold lacquer and provided with a vegetable fiber ring attached to the metal top. Where food products are packed by commercial concerns, tin cans are commonly used. These cans are often classified as "packers' cans," with solder-hemmed caps, and "sanitary cans," which are hermetically sealed by machines especially made for the purpose (see illustration).

No special equipment is required to can by the cold-pack process. Glass jars or containers found in the home may be used. A satisfactory sterilizer or hot water bath outfit may be made by placing a wooden rack in the bottom of a tall can or vessel to support the jars. Four rules cover the instructions for the operation of this home-made sterilizer:

(1) Have a rack in the bottom of the sterilizer that will permit the water to circulate under it and around and over the top of the jars.

(2) Have the water cover the jars by at least an inch.

(3) Count the time as soon as the water begins to jump.

(4) Remove the jars from the sterilizer at the close of the sterilizing period and tighten the covers.

There are numerous commercial hot water bath outfits on the market, some provided with stove attachments and others arranged for heating on top of the family cookstove. These commercial outfits have a convenient arrangement for lifting the jars in and out of the sterilizer. The sterilizing period for the home-made hot water bath outfit and for the commercial hot water bath outfit is the same.

The steam pressure sterilizers can be conveniently divided into three classes, as follows: (a) Water-seal, or 214-degree outfit (see illustration); (b) the five-pound steam pressure, or 228-degree outfit; (c) the fifteen-pound steam pressure, or 250-degree outfit. All steam pressure outfits are provided with a safety valve to prevent too much pressure on the sterilizer, a pet cock to release the pressure before opening the canner, and a steam gauge or thermometer to indicate the pressure maintained on the outfit. Each type of outfit will do the work successfully, if properly operated. In the recipes given below, time tables are printed for sterilizing in the hot water bath, the 214-degree outfit, the five-pound steam pressure outfit and the fifteen-pound pressure outfit:

Fruits

Soft Fruits. Strawberries, blackberries, dewberries, sweet cherries, blueberries, apricots, grapes, plums, huckleberries.

Recipe for canning soft fruits. Can the same day fruit is picked. Grade and rinse the fruit by pouring water over it through a strainer. Cull, seed and stem. Pack immediately in glass jars or tin cans. Add boiling hot sirup of eighteen per cent density (thin). Place rubber and top in place. Partially tighten. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used.

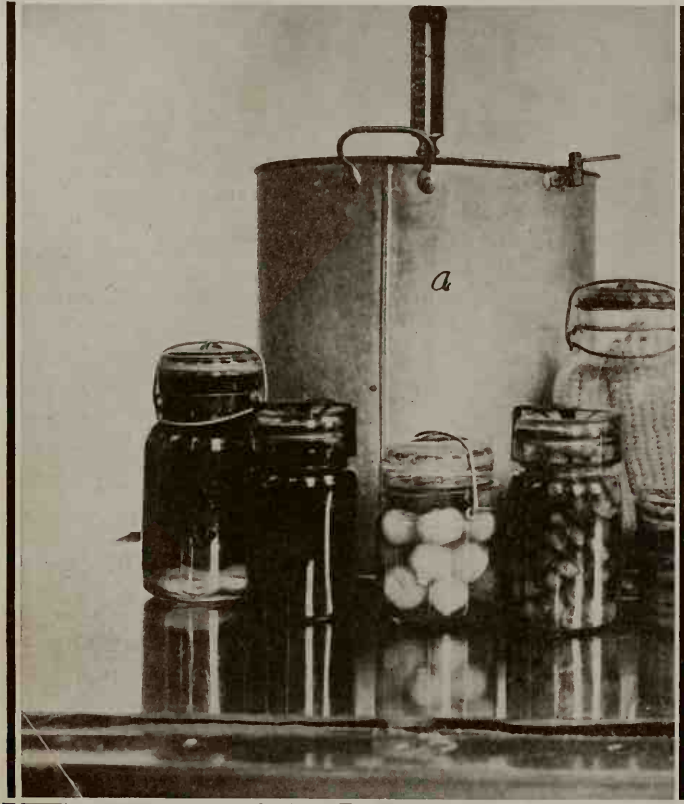
	MINUTES
Water bath	16
Water seal at 214°	10
Steam pressure 5 pounds	8
Steam pressure 10 pounds	5

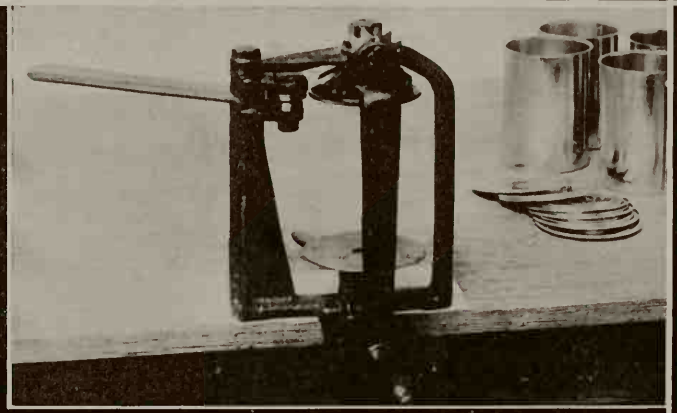
Remove the jars. Tighten the covers. Invert the jars to cool and test the joint. Wrap the jars with paper to prevent bleaching.

(Sirup: one and one-half quarts of sugar to one quart of water, boiled to medium thickness.)

Sour Berry Fruits. Currants, gooseberries, cranberries and sour cherries.

Recipe for canning sour berry fruits. Can same day picked. Steam, hull and clean. Blanch in hot water one minute. Remove and dip quickly in cold water. Pack berries closely in container. Add hot sirup of twenty-eight per cent density





APPARATUS FOR CANNING.

At left: (*a*) is a water-seal 214° canner; fruit and vegetables in glass jars. Right, above: Hand-sealing device for sanitary cans; cans and caps on table. Below: parts of glass jar.

A CANNING CLUB MEMBER AT HOME.

Filling jar with boiling water. A fifteen-pound steam pressure canner is shown on gas stove.

until full. Place rubber and cap in place. Seal partially, not tight. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	16
Water seal, 214°	12
Steam pressure 5 pounds	10
Steam pressure 15 pounds	5

Remove the jars. Tighten the covers. Invert the jars to cool and test the joint. Wrap the jars with paper to prevent bleaching.

Hard Fruits. Apples, pears, quinces, peaches, pineapple, figs.

Recipe for canning hard fruits. Grade, blanch one and one-half minutes, and plunge quickly in cold water. Core, pit, or remove skins, if necessary. Pack whole, quartered, or sliced, as desired. Add boiling-hot sirup of from eighteen to twenty-eight per cent density (medium thin). Place rubbers and tops in position. Partially tighten. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	20
Water seal, 214°	12
Steam pressure 5 pounds	8
Steam pressure 15 pounds	6

Remove the jars. Tighten the covers. Invert the jars to cool and test the joint. Wrap the jars with paper to prevent bleaching.

Vegetables

Vegetable greens, both wild and cultivated.

Recipe for canning vegetable greens. Prepare and can the day picked. Sort and clean. Blanch in a vessel with a little water under false bottom or in a regular steamer, fifteen to twenty minutes. Remove. Plunge quickly into cold water. Cut in convenient lengths. Pack tight in jar or container and season to taste; add a little chipped beef, olive oil, etc. Add hot water to fill crevices, and a level teaspoonful of salt to each quart. If using glass jars, place rubber and top in position, partially seal; if using tin cans, cap and tip completely. Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	120
Water seal, 214°	90
Steam pressure 5 pounds	80
Steam pressure 15 pounds	45

Remove from canner. Tighten covers. Invert to cool and test joints. Wrap in paper to prevent bleaching and store.

Root and Tuber Vegetables. Carrots, parsnips, beets, turnips, sweet potatoes.

Recipe for canning root and tuber vegetables. Grade for size, color and degree of ripeness. Wash thoroughly. Use vegetable brush. Scald in boiling hot water sufficiently to loosen skin. Plunge quickly in cold water. Scrape or pare to remove skin. Pack whole or cut in sections or cubes, as required by the home or market standard. Add boiling hot water and one level teaspoonful of salt to the quart. Place rubbers and tops in position. Partially seal, but not tight. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	90
Water seal, 214°	75
Steam pressure 5 pounds	60
Steam pressure 15 pounds	40

Remove the jars. Tighten the covers. Invert the jars to cool and test the joint. Wrap the jars with paper to prevent bleaching.

Special Vegetables. Tomatoes and corn.

Recipe for canning tomatoes. Grade for size, ripeness and color. Scald in hot water enough to loosen skins. Plunge quickly in cold water. Remove. Core and skin. Pack whole. Fill container with whole tomatoes only. Add one level teaspoonful of salt to each quart. Place rubber and cap in position. Partially seal, but not tight. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	22
Water seal, 214°	18
Steam pressure 5 pounds	15
Steam pressure 20 pounds	10

Remove jars. Tighten covers. Invert to cool and test joints. Wrap jars in paper and store.

Recipe for canning sweet corn on the cob. Can corn the same day picked. Remove husks, silks and grade for size. Blanch on the cob in boiling water five to fifteen minutes. Plunge quickly in cold water. Pack ears, alternating butts and tips, in half-gallon glass jars or gallon tin cans. Pour over boiling hot water and add two level teaspoonfuls of salt to each gallon. Place rubbers and tops in position. Seal partially but not tight. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	180
Water seal, 214°	90
Steam pressure 5 pounds	60
Steam pressure 20 pounds	35

Remove jars. Tighten covers. Invert to cool and test joints. Wrap glass jars with paper and store.

NOTE. When sweet corn is taken from jar or tin can for table use, remove ears as soon as jar or can is opened. Heat corn, slightly buttered, in steamer. Do not allow ears to stand in water or to be boiled in water the second time.

Recipe for canning sweet corn cut from cob. Can the same day as picked. Remove husks and silks. Blanch on the cob in boiling hot water five to fifteen minutes. Plunge quickly in cold water. Cut the corn from the cob with a thin, sharp-bladed knife. Pack corn in jar tightly until full. Add one level teaspoonful of salt to each quart and sufficient hot water to fill. Place rubbers and tops in position. Partially seal, but not tight. (Cap and tip tin cans.) Sterilize the length of time given below for the type of outfit used:

	MINUTES
Water bath	180
Water seal, 214°	90
Steam pressure 5 pounds	60
Steam pressure 20 pounds	35

Remove jars. Tighten covers. Invert to cool and test joints. Wrap with paper and store.

Other Vegetables. Lima beans, string beans, peas, okra.

Recipe for canning. Can same day vegetables are picked. Cull, string, grade. Blanch in boiling hot water for two to five minutes. Remove and plunge quickly in cold water. Pack in container until full. Add boiling hot water to fill crevices. Add one level teaspoonful of salt to each quart. Place rubbers and tops in position. Partially seal, but not tight. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	120
Water seal, 214°	90
Steam pressure 5 pounds	60
Steam pressure 20 pounds	40

Remove jars. Tighten covers and invert to cool. Wrap jars in paper and store.

Canning pumpkin and squash. Cut up into convenient sections. Core and remove skins. Cook for thirty minutes to reduce to pulp. Pack in glass jars or tin cans. Add one cup of sugar and one teaspoonful of salt to each quart of pulp. Place rubber and top in position. Partially seal, but not tight. Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	60
Water seal, 214°	50
Steam pressure 5 pounds	40
Steam pressure 20 pounds	30

Remove jars. Tighten covers. Invert to cool and test joints. Wrap in paper and store.

Preserves

Strawberry. Make a sirup of one quart of water and eleven pounds of sugar and cook it in an open kettle until a candy thermometer registers 265° when placed in the sirup. Add eight pounds of berries to the sirup. Cook very slowly, just at the boiling point. Stop the cooking when the thermometer registers 219° and pour into shallow pans to cool. Hasten the cooling by pouring sirup over the berries. Skim while cooling. Fill into jars when cold and allow them to stand unsealed for four days. Put the rubber and cap in position, not tight. (Cap and tip if using enameled tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	20
Water seal, 214°	15
Steam pressure (see note under cherry preserves)	15

Remove the jars. Tighten the covers. Invert the jars to cool and test the joint. Wrap the jars in paper to prevent bleaching.

Cherry. Place one gallon of water in a kettle and add ten pounds of pitted cherries. Boil slowly for eighteen minutes. Add twelve pounds of granulated sugar and cook until the product is boiling at a temperature of 219°. Cool quickly in shallow pans. Pack into glass jars. Put the rubber and cap in position, not tight. (Cap and tip if using enameled tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	20
Water seal, 214°	15
Steam pressure (see note)	15

NOTE. When using pressure-cooker outfits on preserves, keep valve open during sterilization.

Sun Preserves

Strawberry. Select ripe, firm berries. Pick and preserve them the same day. Hull and rinse thoroughly. Place them in a shallow platter in a single layer; sprinkle sugar over them; pour over them 40° sirup (same as strawberry preserves, above, boiled thicker). Cover them with a glass dish or a plain window glass. Allow them to stand in the hot sun eight or twelve hours. Pack them in glass jars or cups; tie paper over the tops or cover with paraffin or sealing wax. Keep in cool, dry place.

Soups

Soup Stock. Secure twenty-five pounds of beef hocks, joints and bones containing marrow. Strip off the fat and meat and crack bones with a hatchet or cleaver. Put the broken bones in a thin cloth sack and place them in a large kettle containing five gallons of cold water. Simmer (do not boil) for six or seven hours. Do not salt while simmering. Skim off all fat. This should make about five gallons of stock. Pack hot in glass jars, bottles, or enameled or lacquered tin cans. Partially seal glass jars. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	40
Water seal, 214°	30
Steam pressure 5 pounds	30
Steam pressure 15 pounds	25

Check list of supplies to be provided before beginning work.

25 pounds of beef bones
5 gallons water

Vegetable Soup. Soak one-fourth pound lima beans and one pound rice for twelve hours. Cook one-half pound pearl barley for two hours. Blanch one pound carrots, one pound onions, one medium sized potato and one red pepper for three minutes and cold dip. Prepare the vegetables and cut into small cubes. Mix thoroughly lima beans, rice, barley, carrots, onions, potatoes, red pepper. Fill glass jars or the enameled tin cans.

Chicken-Soup Stock. Place thirty pounds chicken in ten gallons of cold water and simmer for five hours. Remove meat and bones, then strain. Add sufficient water to make ten gallons of stock. Fill glass jars or tin cans with the hot stock. Partially seal glass jars. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	90
Water seal, 214°	75
Steam pressure 5 pounds	60
Steam pressure 15 pounds	45

This stock is used to make soup where the term "chicken-soup stock" is employed.

Check list: 30 pounds chicken
10 gallons water

Vegetables (Mixed) Without Stock. Many people would like vegetable soup during the winter season, but find it impracticable to secure the soup stock during the summer season when the vegetables are so abundant that they are rotting in the garden. It is suggested that the vegetable portion of the soup be canned during the summer and made available when the soup stock is prepared during the winter. It makes the preparation of the soup a simple matter whenever the stock is available.

Soak six pounds of lima beans and four pounds of dry peas over night. Boil each one-half hour. Blanch sixteen pounds of carrots, six pounds of cabbage, three pounds of celery, six pounds of turnips, four pounds of okra, one pound of onions and four pounds of parsley for three minutes and dip in cold water quickly. Prepare the vegetables and chop them into small cubes. Chop the onions and celery extra fine. Mix all of the vegetables, and season to taste. Pack in glass jars or tin cans. Fill with boiling water. Partially seal glass jars. (Cap and tip tin cans.) Sterilize the length of time given below for the particular type of outfit used:

	MINUTES
Water bath	90
Water seal, 214°	60
Steam pressure 5 pounds	60
Steam pressure 15 pounds	45

Check list:

16 pounds carrots (small)	4 pounds okra
6 pounds cabbage	1 pound onions
3 pounds celery (stems and leaves)	4 pounds parsley
6 pounds turnips	4 pounds dry peas
6 pounds lima beans	Salt and pepper to taste

Meat

Poultry and Game

Recipe No. 1. Kill fowl and draw at once; wash carefully and cool, cut into convenient sections. Place in wire basket or cheesecloth and boil until meat can be removed from bones; remove from boiling liquid and remove meat from bones; pack closely into glass jars; fill jars with pot liquid, after it has been concentrated one-half; add level teaspoonful of salt per quart of meat, for seasoning; put rubber and cap in position, not tight; sterilize the length of time given below for the particular type of outfit you are using:

	HOURS
Water bath	3½
Water seal, 214°	3
Steam pressure 5 pounds	2½
Steam pressure 15 pounds	1

Remove jars; tighten covers; invert to cool and test the joint; wrap jars with paper to prevent bleaching.

Recipe No. 2. Kill fowl and draw at once; wash carefully and cool; cut into convenient sections and pack at once into glass jars; fill with boiling water; add level teaspoonful of salt per quart; put rubber and cap in position, not tight, and sterilize the length of time given below for the one particular type of outfit you are using:

	HOURS
Water bath	4
Water seal, 214°	3½
Steam pressure 5 pounds	3
Steam pressure 15 pounds	1

Remove jars; tighten covers; invert to cool and test the joint; wrap jars with paper to prevent bleaching.

Fresh Beef. As soon as beef has been killed, cool quickly and keep cool for about twenty-four hours. Cut the beef into convenient pieces for handling, about three-fourths pound in weight, and roast or boil slowly for one-half hour. Cut into small pieces, remove gristle, bone and excessive fat, and pack directly into glass jars; fill with gravy from the roasting pan, or pot liquid, concentrated to one-half its volume; put rubber and cap in position, not tight, and sterilize the length of time given below for the one particular type of outfit you are using:

	HOURS
Water bath	4
Water seal, 214°	4
Steam pressure 5 pounds	3½
Steam pressure 15 pounds	1½

Remove jars; tighten covers; invert to cool and test the joint; wrap jars with paper to prevent bleaching.

Corned Beef. After beef has been properly corned for required time, remove the meat from the brine; soak for two hours in clear water, changing the water once; place in a wire basket and boil slowly for one-half hour; remove from the boiling water, then plunge into cold water; remove gristle, bone and excessive fat; cut into small pieces and pack closely into glass jars; put rubber and cap in position, not tight, and sterilize the length of time given below for the one particular type of outfit you are using:

	HOURS
Water bath	4
Water seal, 214°	4
Steam pressure 5 pounds	3
Steam pressure 15 pounds	2

Remove jars; tighten covers; invert to cool and test the joint; wrap jars with paper to prevent bleaching.

Canned Pork. After the animal has been butchered, cool quickly, and keep the pork cool for at least twenty-four hours; can only lean portions, using the fat to make lard; place meat in a wire basket or cheesecloth and boil for thirty minutes, or roast in the oven for thirty minutes; cut into small sections and pack closely into glass jars; put rubber and cap in position, not tight; and sterilize the length of time given below for the one particular type of outfit you are using:

	HOURS
Water bath	4
Water seal, 214°	3
Steam pressure 5 pounds	3
Steam pressure 15 pounds	1½

Remove jars; tighten covers; invert to cool and test the joint; and wrap jars with paper to prevent bleaching.

Canned Salmon. Make a brine of salt and water that will support a potato, and after cleaning the fish properly, place in brine for one-half

hour; remove from brine; cut into convenient sections; and pack in glass jars, with the skin toward the outside. Add level teaspoonful of salt per quart; put rubber and cap in position, not tight; and sterilize for the length of time given below for the one particular type of outfit you are using:

	HOURS
Water bath	3
Water seal, 214°	3
Steam pressure 5 pounds	2½
Steam pressure 15 pounds	1½

Remove jars; tighten covers; invert to cool and test the joint; wrap the jars with paper to prevent bleaching. G.E.F.

Related Subjects. The reader is referred to the following articles in these volumes:

Boys' and Girls' Clubs Gardening
Canning Clubs School Garden

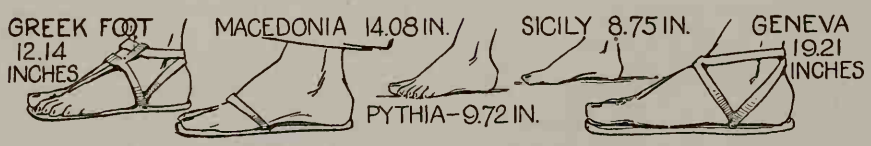
and to each fruit, vegetable or other product named in the text of the above article.

FOOLS, Feast of, a celebration of unknown origin, current between the fifth and sixteenth centuries in many countries of Europe, marked by merriment and absurdities of a boisterous nature. It was a Christian form of the Roman Saturnalia, and in common with that festival, occurred in December. The ceremonies usually consisted of dramatic representations, the principal church of the place serving as the theater, and if the clergy did not actually participate they formed an interested audience. One form of celebration consisted in the election of a mock pope, cardinal, archbishop, bishop or abbot, under the title of *Pope of Fools, Boy Bishop, etc.* On election day the mob took possession of the churches, and even mimicked the performance of the highest offices of the Church. The orgies which continued in many places until the sixteenth century, and in the south of France survived until 1644, became so marked by license and lawlessness that they were finally prohibited by the Church.

FOOT, a measure of length originally based on the length of the human foot, to which fact its name is due. The accompanying illustration shows how the standard has varied in different countries. In the English system, in general use in America and Great Britain, the length of a foot is twelve inches, or .3048 of a meter (see Metric System). The foot of twelve inches was adopted in England in the reign of Henry I, the length of whose arm was declared to be the standard length of one yard. The foot was then made one-third of a yard.

In arithmetic, the *square foot* is a unit of measure in square or surface measurement. This unit is equivalent to a square, each of whose sides is one foot long. It therefore contains 12×12, or 144, square inches. In measuring solids, a *cubic foot* is a unit of measure. This is equivalent to a cube one foot high, one foot wide and one foot in breadth (see Cube). It contains 12×12×12, or 1728, cubic inches. The *board foot,* a unit of measure for logs and lumber, is a board one foot square and one inch thick; therefore a board 12 feet long, 1 foot wide and 2 inches thick contains 24 board feet. See Square Measure; Cubic Measure.

FOOT, that portion of the skeleton of man and other vertebrate (back-boned) animals which forms the termination of the legs. In regard to structure, the foot bears a close



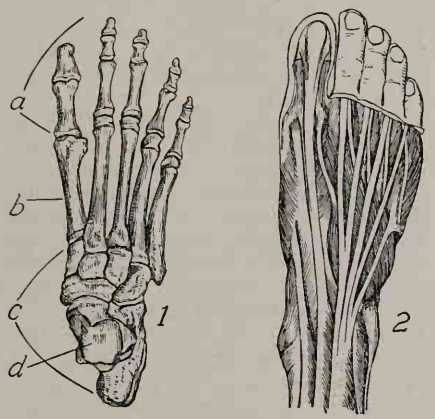
THE ORIGIN OF THE FOOT AS A STANDARD OF LINEAR MEASURE

resemblance to the hand, but its bones are larger and stronger and at the same time less flexible than those of the hand. The skeleton of the foot consists of seven rounded *tarsal* bones, which lie below the ankle joint and form the instep; five slender *metatarsal* bones, which form the ball of the foot, and fourteen *phalanges,* found in the toes. There are two phalanges in the great toe of each foot and three in each of the other toes.

The foot bones in man are so arranged as to form an elastic arch, which reaches from the rear end of the heel to the front ends of the tarsal bones. In walking, the arch bears upon the ground only at the heel and ball of the foot, and it is admirably adapted to breaking the jars which would be transmitted to the spinal column were the foot not provided with this natural, elastic spring. The arched instep is one of the characteristics which distinguish man from the beasts. Nearly all of the lower animals walk upon the tips of their toes, and even those which rest the heel on the ground in walking, as the bears, have only a slightly-developed arch. A high arch is considered a sign of beauty in the human foot, and it per-

forms an important service in making the gait easy and graceful.

In the act of walking, the foot, as it receives the weight of the body, broadens a little and



THE FOOT

(*a*) Phalanges (*c*) Tarsals
(*b*) Metatarsals (*d*) Astragalus

In the second illustration the white lines indicate extensor muscles.

also lengthens, perhaps a half-inch. The practice of wearing tight shoes, which interfere with this natural expansion, is therefore unhygienic. The discomfort occasioned by shoes that pinch the feet is well known. Unsightly and painful bunions on the side joint are caused by wearing shoes that are too short; when the toes are crowded against each other in too-narrow shoes corns and ingrowing toenails result. Broad, low heels that furnish a firm support should be chosen in preference to high heels that throw the feet forward toward the ends of the shoes, and tend to flatten down the arch of the foot.

It is interesting to compare the powers of the human hand and foot. The toes, except in special instances, are quite inferior to the fingers in flexibility and dexterity, because they are not called upon to perform such a variety of movements. This difference is especially noticeable in the case of the thumb and great toe. With the thumb we can touch each of the fingers with perfect ease, but the great toe can be moved only a little way in each direction. Savages who have never worn shoes, and apes, whose four limbs are about equally exercised, differ from civilized man in having a more flexible great toe.

The toes can be educated to perform some acts ordinarily performed by the fingers. Many persons born without hands or deprived of them by accident have learned to write, paint and carry on many other activities with their feet. S.C.B.

FOOT AND MOUTH DISEASE, a contagious and rapidly-spreading fever occurring chiefly in cattle, sheep and pigs, but which may be contracted by human beings. It is characterized by blisters, which first break out in the mouth but later may appear on the feet. It first occurred in England in 1839, and did not appear in America until 1870.

No certain microbe has been found which causes it, but it is known to be brought about by direct contact, infected feed, contaminated stables and even by birds carrying the disease to considerable distances. Probably it is most commonly contracted through the mouth by eating contaminated hay as feed and by feeding in pastures where cattle already sick have been kept.

The disease breaks out somewhat mysteriously, not following any certain rule or limiting itself to any one locality or country. Thus outbreaks occurred in 1880 and 1884, followed by complete disappearance until 1902. Then again it was stamped out and was not heard of after that until 1908, when an outbreak occurred in Michigan and spread to New York, Pennsylvania and Maryland. By that year the "scourge of Europe," as it was called, was looked upon as a serious affair; therefore the government and states involved ordered all infected herds bought, killed and buried in quicklime, and the locations were quarantined for three months afterwards. These measures were successful. In 1914 the disease reappeared, involving twenty-two states and the District of Columbia, but within a year all were free from it except Illinois, where it persisted a year longer. The method employed was to kill, bury in lime, and to quarantine; this has cost thousands and thousands of dollars, but it is considered by experts better than halfway measures, which, because they do not eradicate the disease, would eventually cost millions of dollars in losses of stock.

Symptoms. The period of incubation is usually from three days to one week. The early symptoms are smacking of the lips and drooling, preceded by fever. The animal shows a disinclination to move and when in motion walks "stiff." In about two days the characteristic blisters can be seen in the mouth, on the inner side of the lips and on the edges and tip of the tongue. The animal drops saliva

from the mouth. The smacking of the lips at this stage can be heard at a distance. The blisters rupture in two or three days and leave an ulcer, which may heal quickly or very slowly.

Soon the animal begins to be lame, drawing up one foot to ease the pain. The characteristic blisters are then seen on the skin above the hoof, and later the hoof may separate in places. The teats of cows are often broken out in blisters. In the malignant form of the disease death occurs very suddenly, and as high as fifty per cent of such cases are fatal. The death rate in ordinary cases is from two to five per cent.

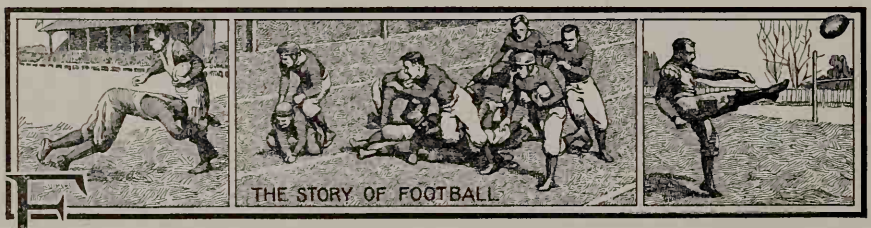
Treatment. This may be considered under two heads, the *preventive* and the *medicinal.*

Preventive treatment consists in carefully isolating all well animals to keep them from coming in contact with the disease, and then thoroughly disinfecting the sheds, pens, etc., in which the stock has been kept. The contaminated feed, litter, etc., should all be burned or buried, following which the premises should be quarantined for three months. The infected stock and all other animals which have been exposed and may contract the disease should be killed and buried in quicklime; experts make no exception to this ruling.

Medicinal treatment consists in thorough cleanliness of the premises, soft food like gruel, and mashes. Chlorate of potash or nitrate of potash may be given in the drinking water and mild astringent applications made to the hoofs.

Danger to People. Man may contract the disease from drinking milk from infected cows, or getting the saliva in a raw place on the hands, as when milking, particularly on the fingers and at the roots of the nails. Young children are especially liable to take the disease and may die as a result. The outcome in adults is usually favorable. The milk from infected cows should be destroyed and attendants should be very careful to wash their hands in antiseptic solution, cauterizing with carbolic acid any cut or raw places. J.R.M.

Consult Melvin's *The 1908 Outbreak of Foot and Mouth Disease in the United States,* in the annual report (1908) of the Bureau of Animal Industry, Washington, D. C.; also *Circular No. 141,* United States Department of Agriculture, Bureau of Animal Industry.



FOOTBALL, next to baseball the most popular athletic game in the world, is played principally in the British Empire and in the United States. It is a very ancient form of exercise and amusement. The Indians of North America and the aborigines of many of the Pacific islands played a similar game, and it is not at all improbable that football, in some form, was known in the far-off days when all Europe was in barbarism. The Greeks seem to have taught it to the Romans, and the latter, through their soldiers, to the Britons and other races of the north. In the British Isles football was played in the Middle Ages by whole communities, who kicked the ball without clear design through the streets or over the meadows, in such a rough fashion that the game was sometimes forbidden by statute. Only in the nineteenth century did it become an organized game, with fixed numbers on each side and definite methods of counting score. Weight, physical fitness and endurance are prime requisites in players, but quick thinking is vitally necessary.

It was at the great English schools like Rugby, Harrow and Eton that football was first made practical. The boys' playground at Rugby was large, and there was plenty of room for running and tackling. At other schools, even as late as 1850, the game was confined to kicking and bunting the ball. Thus two distinct types of football have developed: *Rugby,* which permits running with the ball, and *Association* or *Soccer,* which prohibits it. The former includes English, Canadian and American Rugby, three distinct styles of play. The variations in these plays is made clear in the paragraphs that follow.

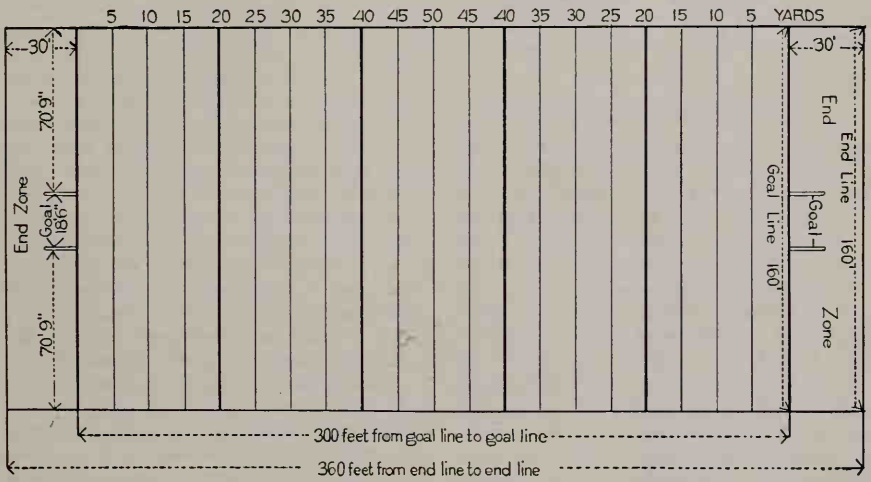
Football in the United States

The name *American Rugby* sounds strange to football players in the United States, but it is the correct name for their game. The early Virginia colonists brought the older English game to America, and soon after 1830 students at several of the eastern colleges began to play it. Ten years later, at Amherst, Brown, Harvard, Trinity and Yale, there were interclass games resembling the class rushes which still take place in some colleges, and so rough did they become that in 1860 the faculties of Harvard and Yale prohibited football. At Princeton a more orderly game was played, adapted from the English "Association" code, and in 1869 the first intercollegiate contest took place between Princeton and Rutgers. In 1871 football was revived at Harvard, with rules which permitted running with the ball, as in Rugby; two years later Harvard's team refused to join the association formed by Yale, Columbia, Princeton and Rutgers because its players would not abandon the Rugby style of play.

Not long after this, McGill College in Montreal challenged Harvard to a match, and on May 15, 1874, these two teams played the first intercollegiate Rugby match in America. McGill's players were accustomed to English Rugby rules and Harvard's to their own version of them, so on the preceding day the two teams courteously coached each other in tactics. On the 15th a match was played under Harvard rules, and Harvard scored three times. The next day, under McGill rules, neither side was able to score. The success of these two contests aroused enthusiasm for Rugby, and in 1875 Harvard and Yale played a game under a compromise set of rules which admitted both of running with the ball and of batting the ball with the hand. This compromise was unsatisfactory, and in 1876 Columbia, Princeton and Yale abandoned the other form of football in favor of straight Rugby.

Like all the more popular athletic competitions of the colleges of the United States, football has become a highly-specialized activity. The original Rugby rules have been entirely superseded by a gradual development of a code much more complex but permitting a far higher development of team play. Players are trained by professional coachers who in some cases receive several thousand dollars for a season's work. Each man is drilled in the elements of the game by long hours of practice in tackling dummies and charging against wooden frames. Team work is taught in scrimmages, the sham battles of football, and strategy is studied by blackboard talks. Though the game is played only in the autumn, the more ambitious colleges have practice in the spring as well.

As a result of all this care, a football game between two great colleges is one of the most interesting and exciting spectacles anywhere



THE "GRIDIRON," ON WHICH FOOTBALL IS PLAYED IN THE UNITED STATES

to be seen. The famous contests between Harvard and Yale attract the largest crowds, which seem to be limited only by the seating capacity of the Harvard Stadium, which will accommodate 47,000 people, and of the great Yale Bowl, which seats over 70,000. A number of "gridiron battles" in both the East and Middle West are scarcely less popular. Football in the United States is largely confined to schools and colleges, *clubs* like those of Canada being quite unknown.

How Played in the United States. Why a Rugby field is called a *gridiron* is apparent at first sight of one. As shown in the accompanying diagram of the field in the United States, distinct lines, which on the field are white, mark the borders and cross from side to side every five yards. The *goals* are upright timbers joined ten feet above the ground by a crossbar.

Each team defends a goal and attempts to score by carrying the ball across its opponents' goal line anywhere between the edges of the field, or by kicking it from the ground over the bar. The ball is a leather casing about a foot long and seven inches in diameter, enclosing an inflated rubber bladder. There are eleven players on each side, seven of whom compose the *line,* and four the *back-field.*

At the opening of the game one team places the ball in the middle of its forty yard line (that is, forty yards from its own goal), and lines up along the same mark. The other team is distributed throughout its half of the field. One member of the first team *kicks off* towards the opponent's goal, but does not necessarily attempt to kick the ball over it, as at this time no score would be counted. The opponent who catches the ball runs forward with it, dodging back and forth to avoid the onrushing men of the first team, and following two or three of his teammates, who form *interference* (protection) for him. He is usually *tackled* and thrown to the ground or stopped before he has reached the center of the field, but now and then a clever runner makes his way through the whole opposing team and reaches its goal. As soon as he is stopped the referee blows his whistle and the teams line up for the first *scrimmage.*

Scrimmage. The team in possession of the ball is now given four opportunities to advance it ten yards. The player called the *center* puts his hands on the ball, which rests on the ground with its points toward the ends of the field, and prepares to pass it backwards between his legs. To his right are the right *guard,* the right *tackle,* and the right *end;* to his left are the corresponding members of the left side of the line. Behind him are the *quarter-back,* the left and right *half-backs* and the *full-back.* The quarter-back is the directing general; upon his strategy and good judgment largely depends the success of the team. The instant the ball is *down* he begins to call secret signals, a rapid succession of numbers, and then he stands close to the center to receive the ball as the latter passes it, and to give it to the player who, in response to his signal, is to run with it. The line men of the opposing team are lined up behind the other end of the ball, the back-field men forming a secondary defense behind them.

Play commences the moment the center snaps the ball. If the signal has been for a plunge through the opposing line, it is the duty of some of the line men to spread apart their opponents and make a hole through which the runner may pass, and of the others to hold back the players opposite them. The back-field men assist the runner in various ways. But no player of the attacking side except the runner is allowed to use his hands or arms upon an opponent or those who are attempting to tackle him. The players on the defense may use their hands and arms to break through in an endeavor to reach the ball or the man carrying it. If instead of a line plunge the play is a run around the end, the whole offensive line aims to hem in their opponents so that they can neither stop the runner from in front nor reach him from the rear. The usual gain from a line plunge or an end run is only a few yards, if the teams are evenly matched, but sometimes a runner succeeds in going a long distance before he is tackled. On the other hand, if the offensive line is less alert than the defenders, the ball may be downed farther back than before.

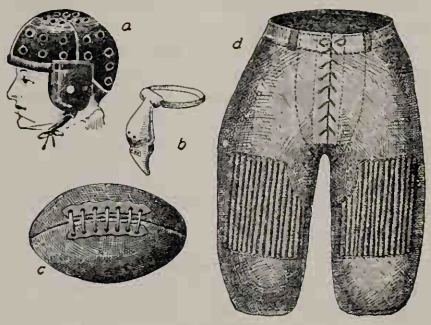
The Forward Pass. Though it has always been one of the principles of Rugby football that the ball could be advanced only by running or kicking, the forward pass has recently been introduced into the American game to add interest to the spectacle and to lessen the strain on the players from continued playing at close quarters. It is difficult to execute. The quarter-back, or any man behind the line, standing five yards back of the line, receives the ball from the center and throws it to one of his men who has run to a point where he can catch it and get away without being

tackled. The only men eligible to receive this forward pass are the two men on the end of the line or a man in the back-field who was at least one yard back of the line when the ball was put in play. Sometimes a forward pass results in a long gain; at other times an opponent catches it and dashes off down the field; or, again, the ball may fall to the ground untouched and be brought back by the referee to the point where the play started, one of the team's four chances to advance having been wasted.

Punt. A ball dropped from a player's hands and kicked before it touches the ground is said to be *punted.* If a team fails to gain its ten yards in the four tries permitted, the ball will pass to its opponents. If, therefore, at the fourth *down* the quarter-back sees that his men may fail to advance the necessary distance, and they are not near the others' goal, he may give the direction for a punt. The punter stands several yards back of his line men, so as to have plenty of time to kick. He sends the ball high in the air in order that the ends may run down under it and be at hand to tackle the man who catches it. A good punter will advance the ball from forty to sixty yards, but unless the opponents fumble it, possession of it passes to their team.

Scoring. If a team can put the ball down on or behind the other's goal line, it scores a *touchdown,* and earns six points. The ball is then brought straight out, or punted out to a point in front of the goal posts, and placed on the ground. Here one player holds it for another to kick, and if it passes over the cross-bar another point is added to the score.

When a touchdown seems improbable, a team in its opponent's territory may attempt a *field goal,* which counts three points. This may be any kind of a kick except a punt. It is usually either a *place-kick,* similar to the goal-kick after a touchdown, but necessarily more hurried and therefore more difficult, or a *drop-kick,* in which the ball is dropped as in punting but kicked just as it touches the ground. In either case the ball must pass above the crossbar to score. A goal made from thirty-yards' distance is considered an excellent performance, but the record for a place-kick is sixty-five yards and for a drop-kick sixty-two yards. If a team carries or kicks the ball across its own goal line and is there downed, two points, called a *safety,* are scored against it. If, on the other hand, it downs a ball which its opponents have propelled or carried across, the result is a *touchback,* and no score is made. After either a touchback or safety the ball is given to the defending side on its twenty yard line, for a scrimmage.



USED IN THE GAME

(*a*) Headgear
(*b*) Nose guard
(*c*) Ball
(*d*) Trousers

Signals used by a quarter-back in directing his team are usually very simple. Sometimes each player has a secret number, and the signal 10-4-16-47-2 might mean that player number ten is to carry the ball through the hole prepared by player number four, the other numbers being without meaning. Or the numbers may refer to the play instead of the men, ten meaning that the full-back is to carry the ball around the left end, nine that he is to carry it around the right end. To

conceal the code the numbers which actually carry the message are usually preceded or followed by others. Thus it might be agreed that the third number should be the significant one. A starting signal is also sometimes used which indicates to the attacking side the instant the play is to start.

The officials of a football game in the United States are the *referee,* the *umpire,* the *linesman* and the *field judge.* Each has duties assigned by the intercollegiate rules. The first two are mainly concerned with the enforcement of the regulations, penalties for violating which are given by moving the ball a specified number of yards toward the goal which the side in error is defending.

The game, unless shortened by agreement, lasts an hour, and is divided into four periods of fifteen minutes each, with a one-minute intermission between the first and second and the third and fourth periods, and a fifteen-minute intermission between the second and third. Delays in the play are not counted as part of the game.

Canadian Rugby and English Rugby

In spite of the fact that English Rugby rules formed the basis for the game in both the United States and Canada, a visitor to either nation from the other finds football bewilderingly strange. Because of the differences in rules many details of good play in the one country would be poor policy in the other. Thus, when an American sees a Canadian kick the ball while running with it he is astonished, but no more than a Canadian who watches an American runner allow himself to be tackled with the ball instead of passing it to another of his team.

The Canadian Game. One of the principal points which distinguish the Canadian game is the rule forbidding *interference;* no player in front of the runner is allowed to protect him from tacklers. Another distinction is that *off-side* players, those who have been in front of the ball when it was kicked or thrown forward, must not come within three yards of an opposing player attempting to make a *free catch* of the ball, even if it has already bounded on the ground. The scrimmage line may consist of only three players, and the ball is put into play by *heeling off*—a backward kick with the heel. Fourteen men belong to each team.

Scoring is as follows: for a *try and goal,* six points; for a *try,* five; for a *drop-kick,* three; for a *drop-kick* or *place-kick* after a penalty, two; for a *safety-touch,* two; for a *rouge,* one. A try corresponds to a touchdown in American football. If a team is downed with the ball behind its own goal line, a safety-touch is counted against it if it has carried the ball there itself, a rouge if the other side has sent or carried it over the line. A rouge is also scored when a team secures the ball more than twenty-five yards behind its opponent's goal, or both behind the goal and outside of the touchline (side line).

Penalties are awarded in various ways, including giving to the opponents the right to attempt a drop-kick or place-kick unhindered.

The Rugby championship in Canada is decided more definitely than in the United States, where it is always largely a matter of individual opinion. Both college and club teams are organized into leagues which play round-robins. At the end of the season the league winners meet for the national championship.

English Rugby. There is little difference between the original game of football and the Canadian game just described. Two features of it which have been abolished in both the United States and Canada are the old fashioned *scrummage* and the *throw-in.* The latter is used when the ball goes out of bounds at the side of the field. Instead of the ball being brought back to the field and put into play by a scrummage, it is thrown in between the two teams, each lined up at right angles to the side of the field. In a scrummage the *forwards,* eight of each team, gather around the ball and push each other with their heads. Each side endeavors to *heel* the ball into a position where its backs may seize and carry it. Neither side has definite possession of the ball as in the two American varieties of the game. There are fifteen men on an English team.

English Rugby is played principally for cups and for national and international championships. England, Scotland, Ireland and Wales meet each other every year, and since 1906 France, too, has figured in the international matches. New Zealand, South Africa and Australia develop teams which usually defeat those of the mother country, and during the War of the Nations there was interesting competition among the soldiers from various parts of the empire.

OUTLINE AND QUESTIONS ON FOOTBALL

Outline

I. History of the Game

(1) A very old game
(2) Development at the great English schools
(3) As played in the United States
  (a) Rugby
  (b) Association or soccer

II. Rugby Football

(1) The field
  (a) Size and shape
  (b) "Gridiron" markings
  (c) Goals
(2) The ball
  (a) Size
  (b) Shape and material
(3) As played in the United States
  (a) Players
    1. Number
    2. Position
    3. Duties
  (b) Officials
  (c) The course of the game
    1. The kick-off
    2. The scrimmage
    3. The forward pass
    4. Punting
    5. Signals
    6. Interference permitted
  (d) Scoring
(4) Differences in Canadian game
  (a) No interference
  (b) Free catch
  (c) Heeling off
  (d) Different method of scoring
  (e) Difference in number of players
(5) Rugby in England
  (a) Number of players
  (b) Differences in manner of play
    1. Scrummage
    2. Throw-in
(6) Widespread popularity

III. Association Football

(1) A faster game
(2) Running with the ball forbidden
(3) Differences in number of players, size of field and shape of ball
(4) Popularity in Great Britain and colonies

Questions

Why is the field on which the game is played called a "gridiron"?

If one side *downs* the ball behind its opponents' goal posts, and then succeeds in its free kick, what is its score?

In what kind of football do the sixteen forwards push each other with their heads? What is this play called?

When is the quarter-back most likely to order a *punt?*

What corresponds in Canadian football to a *touchdown* in the United States game?

What is the advantage of a forward pass? How is it made?

If you were watching a Rugby game, how could you tell from the attitude toward a player running with the ball whether the teams were from Canada or from the United States?

Was the first intercollegiate Rugby game in America a "domestic" or an "international" match?

What restrictions are there on "interference" in case of a line plunge?

Explain the terms *scrimmage; down; tackle; quarter-back.*

Whose duty is it to see that the rules are carried out and that players are penalized for breaking them?

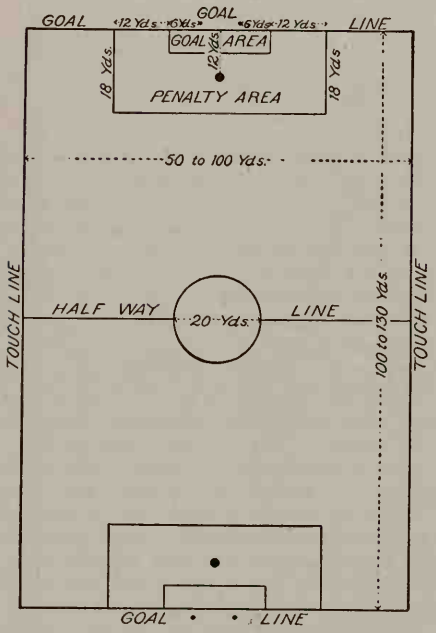
How could you tell an association football from a Rugby?

What is the chief difference between an association and a Rugby game?

Have you ever heard a player during a game call out some such series of numbers as 8-13-19-38-5-4? What is his object?

Association Football

Though perhaps giving both spectators and players fewer moments of tense-muscled suspense than Rugby, "soccer" football is a more lively, spirited and continuously active game. From beginning to end of its ninety minutes of play, interrupted only by the one minute rest at half-time, the ball travels back and forth and up and down the field, now pausing for a



ASSOCIATION FOOTBALL FIELD

moment as two players strive for its possession, then suddenly shooting through the air, now bounding from the head of a player who leaps into the air to intercept it by a bunt, now *dribbled,* or carried along in short kicks, by a player who seems as skilful with his feet as most people are with their hands; suddenly passed to another player by a kick with the side of the foot and driven swiftly toward the net which is stretched between the goal posts; then seized by the goal keeper after a headlong dive and punted quickly to midfield, where the struggle, suspended only for a moment, begins again.

Association football is so named because it is the form of game for which the first set of uniform rules was drafted, by the London Football Association, in 1863. "Soccer" is the word association converted into slang in the British fashion by adding *-er* to the principal syllable. Similarly, "rugger" stands for Rugby.

The popularity of soccer in Great Britain rivals (if it does not exceed) that of baseball in the United States. In normal times there are over 400 professional and 15,000 amateur clubs in the British Isles, and closely-packed, standing crowds of more than 100,000 witness some of the championship matches. There are a number of leagues, which play throughout the winter. On the continent of Europe, too, association football is a familiar game, and before the War of the Nations there was an international federation which included Austria, Belgium, Denmark, England, Finland, France, Germany, Hungary, Italy, Netherlands, Norway, Sweden and Switzerland. Quite naturally the British dominions and colonies also play the game, and it is growing in favor in the United States. In some parts of Canada it is more popular than Rugby.

Association football is played with a spherical ball about twenty-eight inches in circumference, on a field from 100 to 130 yards long and from 50 to 100 yards wide. Eleven players make up a team. The distinguishing principle of the rules is that the ball must never be touched with the hand or arm except by the goal keeper. See the general article ATHLETICS.

W.C.

Consult Camp's *Book of Football;* Yost's *Football for Player and Spectator.*

FOOTE, ANDREW HULL (1806-1863), an American officer who was distinguished as a Federal naval commander, was born in New Haven, Conn. He entered the navy as acting midshipman in 1822, and later was executive officer in the Boston and Brooklyn navy yards. From 1849 to 1851, as commander of the brig *Perry,* he cruised along the African coast for the protection of American commerce and the suppression of the slave traffic. In 1852 he was advanced to the rank of commodore. In 1856, when in command of the China station, during the war between the Chinese and English, he was fired upon by the former, and his demand for an apology being refused, he attacked and captured four of their forts.

In 1861, in the War of Secession, he directed the naval attacks on Forts Henry and Donelson, and was wounded in the engagement. In 1862, at his own request, he was formally detached from the western flotilla, became

chief of the bureau of equipment and recruiting, and in 1863 was appointed the successor of Rear-Admiral Dupont as commander of the fleet off Charleston. He died while on the way to assume the duties of his new position. A book written by him, entitled *Africa and the American Flag,* deals largely with his African cruise of 1849-1851.

FOOTE, Arthur (1853-), an American concert pianist and organist whose compositions have found their way into musical instruction all over America. He was born in Salem, Mass., and is typically American, having studied with the foremost American instructors.

The first of his compositions which won distinction was a *Trio in C Major* for piano and stringed instruments, composed in 1883, at which time he was giving a series of trio concerts. He has written extensively in all forms. Of his longer works, the best known are *Symphonic Prologue, Francesca da Rimini* and *Suite in E Major* for stringed orchestra. He has written musical settings for well-known poems, including Longfellow's *The Wreck of the Hesperus* and *Hiawatha* and five poems after Omar Khayyam. In addition to many pieces for the organ and for church choruses, he has almost a hundred songs to his credit, among them the famous *I'm Wearing Awa'; I Arise from Dreams of Thee; O My Love's Like a Red Red Rose,* and *In Picardie.* Foote's sincerity and genius have had an uplifting influence upon modern American music.

FOOTE, Mary Hallock (1847-), an American novelist and artist, born in Milton, N. Y. After her marriage to a mining engineer she lived for a number of years in Colorado, Idaho and California, and her novels, illustrated by herself, depict western types and scenery. Among them are *The Led Horse Claim, Coeur d'Alène, The Desert and the Sown.* She is also the author of many short stories.

FOOT-POUND. When a bundle of books is lifted from the floor to be placed on the shelves the resistance of the force of gravity must be overcome. In order to overcome it a certain amount of work is done, and this is in proportion to the weight of the books and the height of the shelves. Work therefore means the overcoming of resistance, and it necessitates the expenditure of energy. We can also define work as the action of force through distance. The amount of work to be done is determined by the magnitude of the force, or the weight of the object and the distance through which it acts. In the English system the unit employed to measure work is the *foot-pound.* The foot-pound is the amount of work done in order to raise a weight of one pound through a distance of one foot. In the metric system the unit of work is the gram-centimeter. The gram-centimeter is the work done in order to raise a weight of one gram through a distance of one centimeter.

FORBES-ROBERTSON, Sir Johnston (1853-), one of the most distinguished actors of the day, born in London, England. Originally an artist, he turned to the stage when he was twenty-one and in time was a member of various leading companies, including that of Sir Henry Irving. In 1895 he appeared with Mrs. Patrick Campbell in *The Notorious Mrs. Ebbsmith,* and in *Romeo and Juliet,* in which he and Mrs. Campbell played the title rôles. His first appearance in America with his own company was in 1885 as Orlando in *As You Like It.* Later American successes include *Hamlet, Caesar and Cleopatra, Mice and Men, The Passing of the Third Floor Back* and *The Light That Failed.* He was knighted in 1913.

FORCE. When we throw a ball into the air it falls to the ground. We say that it is the pull of the earth, or the force of *gravity,* which causes its fall. When we catch a ball that has been thrown towards us we say that the force of our hands stops or destroys its motion. When a magnet attracts small pieces of iron we say that it is the magnetic force that has made the pieces of iron move towards it. In physics anything that produces, destroys or changes motion or tends to produce these effects is called a force. By long experience men have learned that the forces of nature always act in a uniform way—in other words, that in nature the same causes will always produce the same effects in similar circumstances. The object of physics and of other sciences is to discover the laws that govern the forces of nature, in order to be able to control them and to use them for our advantage.

Velocity and Acceleration. In physics a force is measured by the velocity it produces in a given mass in a definite portion of time, as for instance, in one pound of mass in one second. The rate at which a body moves is called *velocity,* and the increase of velocity in a given time is called *acceleration.* A body weighing ten pounds will require a force ten times greater than that necessary for a body

of one pound in order to produce upon it the same velocity. It is also evident that a greater force will be necessary in order to produce a still greater velocity or a greater change in motion. We express this by saying that the force required to accelerate any mass is proportional to the mass and to the acceleration produced, and that it is equal to the product of the mass by the acceleration produced. There are two systems for measuring force, the English system, which uses the poundal as the standard unit, and the metric system, which uses the dyne (which see). The laws of motion that govern bodies that fall to the earth are given in a separate article in these volumes (see FALLING BODIES). See also CENTRIFUGAL FORCE; CENTRIPETAL FORCE.

The *field* of a force is the area within which a force acts. Thus the field of force of the earth's gravity extends far beyond the distance to the moon, while the field of a body charged with electricity or of a magnet is limited to a small area around it. O.B.

FORCE BILLS, a name first applied to several bills passed by the United States Congress in 1833, but more recently given to the Lodge Bill to amend the election laws of the United States, and to provide for a more rigid enforcement of such laws. This bill passed the House of Representatives in July, 1890, but was defeated in the Senate. Force bills were so called because the power of the Federal government was forced upon a state in matters which affected the whole nation equally with the state.

During the process of reuniting the North and the South, known as the period of reconstruction, Congress passed a so-called force bill in May, 1870, which made punishable by fine or imprisonment any attempt to bribe or hinder qualified voters from casting their votes at the polls. In 1871 another bill known by this name was aimed against the Ku-Klux Klan, a Southern secret society of nearly half a million members.

The force bill from which the original term was derived related to the question whether a state's rights were subordinate to national rights, and was brought to a head by the action of South Carolina. A new protective tariff law was passed by Congress in 1832 which did not please the South Carolinians, and they declared in convention that the tariff law was of no effect in that state, and threatened to leave the Union if force were used to collect duties on foreign goods coming into the state. The bill passed by Congress aimed to enforce this law, as South Carolina had previously passed a resolution of nullification (which see).

FORD, HENRY (1863-), an American inventor and manufacturer, without doubt the best-known automobile manufacturer in the world. He was born in Greenfield, Mich., attended the district school, and later became a machinist in Detroit. About 1890 he began to experiment with steam carriages, and in 1895, after two years of work, he completed his first gasoline automobile. The Ford Motor Company, which he organized in 1903, became under his presidency the largest maker of automobiles in the world. By standardizing the output to a very simple design it was possible to reduce the price of Ford automobiles to such a point that their sales in 1917 were over 2,000 a day. In the month of March, 1917, his factory made over 59,000 machines.

HENRY FORD

Early in 1914 Ford drew national attention to the prosperity of his company by announcing that henceforth it would share its profits with its employees, and that their share for the first year would be $10,000,000. At the same time the working day was reduced from nine to eight hours, and $5 a day was fixed as the minimum wage for every employee over twenty-one years old, regardless of his position. The total assets of the company increased from an original investment of $28,000 in 1903 to $20,000,000 in 1912 and nearly $100,000,000 in 1916.

In December, 1915, Ford won much notoriety by paying the expenses of a "peace trip" to Europe for about 150 men and women, including reporters, students and a few well-known peace advocates. The "Ford peace-party," as it was called, visited the Scandinavian countries in an effort to arouse neutral opinion to end the War of the Nations. A few of the delegates traveled as far as The Hague, but Ford himself was compelled by illness to return to the United States almost immediately after reaching Norway. The earnestness of Ford and many of the dele-

gates, and the folly of the cry, "We'll get the boys out of the trenches by Christmas" were ridiculed by the American press, and the "peace party" broke up after a few weeks. From the beginning the United States government had disavowed any connection with the Ford party, and the European nations at war gave it no official recognition.

In the Presidential campaign of 1916 Ford was mentioned as a possible candidate on the Republican ticket. He received the endorsement of the voters at the primaries in Michigan and Nebraska, but this endorsement was generally regarded as evidence of a desire to keep the United States at peace with the world rather than of a demand for Ford for President.

In March, 1917, Mr. Ford offered to turn over his entire plant to the Federal government, without profit to his company, in case of war with Germany.

FORD, Paul Leicester (1865-1902), American historical writer and novelist, was born in Brooklyn, N. Y. His novels include *The Honorable Peter Stirling,* which deals with a young attorney's struggle for recognition, and is generally supposed to be based on the life of Grover Cleveland, and *Janice Meredith,* a novel of the American Revolutionary period. Among his historical writings are *The True George Washington, The Many-Sided Franklin,* and *The Writings of Thomas Jefferson.* In a dispute over financial matters Mr. Ford, who had been a cripple all his life, was shot and killed by his brother Malcom, who then committed suicide.

FOREORDINATION, *fore or dina'shun.* Certain Protestant sects have always believed that every event in the history of man is a direct result of the purposes of God—in other words, that every event is *foreordained* by Him. To deny Him such a part in human affairs, they declare, is to limit His knowledge and power. Calvin based much of his theology on the doctrine of foreordination, and the churches which followed his teachings for centuries laid great stress upon it. The result in many instances was a very gloomy form of Christianity, for the original doctrine was distorted until it declared that God ordained certain people to be lost, just as He ordained certain others to be saved. Such interpretations of the doctrine went far beyond the intention of the theologians, who based their views of foreordination on the goodness of God, and believed that He "foreordained" to be lost only those whom He could by no means win to righteousness. In recent years less emphasis has been laid on foreordination.

FORESHORT'ENING, in drawing and painting, is the art of representing objects on a plane surface as they appear to the eye, depending upon an accurate knowledge of form, perspective, and the treatment of light and shade. The figures thus represented convey the impression of the entire length of any object, although only a part of this length actually is shown. An object viewed in an oblique direction is foreshortened. In drawing an object in such a position, less space would be covered than if the object stood straight in front of and on a level with the observer.

Foreshortening is one of the most difficult studies in the art of painting. Michelangelo, Rubens and Correggio were distinguished for their skill in foreshortening; each practiced modeling as an aid in attaining this art. See Industrial Art.

FOR'ESTERS, Ancient Order of, a fraternal organization founded in Yorkshire, England, in 1745, and introduced into America in 1832 by the establishment of a court in Philadelphia. In 1917 there were in the United States three high courts and 441 subordinate courts, with a membership of nearly 50,000. Its entire membership is about 1,600,000. Funds are raised by fixed dues, and annual disbursements in benefits to families of members amount to over $5,000,000. There is a flourishing Canadian branch.

FORESTERS, Independent Order of, a fraternal and benevolent society, with branches in Canada, Great Britain, Norway, France, India and Australia. It was founded in Newark, N. J., in 1874, and reorganized in 1881. There were in the United States in 1917 fifty-five high courts and 4,150 subordinate courts, with a membership of 218,074. The total disbursements of the order since its organization amount to over $45,000,000, with annual benefits to families of members of about $3,900,000.

FORESTERS OF AMERICA, a benevolent and fraternal association which was originally part of the Ancient Order of Foresters. It was founded in England in 1745, and introduced in the United States in 1832. In 1839 the American order became a separate and distinct organization entirely within the United States. In 1917 it had eighteen grand courts and 1,550 sub-courts, with a membership of over 205,000. Since its organization over $44,000,000 has been disbursed in benefits.

FORESTS AND FORESTRY. The use of the word *forest* to describe a heavily wooded tract of land is so common that it seems strange to think that it did not always have that meaning. In earlier years in England a forest did not necessarily have any trees—it was just a stretch of land of any sort, pasture land or even village land, which was set apart for hunting, and usually belonged to the king.

Kinds of Forests. The name *forest* is from the Latin *foris,* meaning *out-of-doors,* and once upon a time, in far bygone ages, the name would have been very suitable, for all out-of-doors was almost literally covered with trees. There were bleak mountain tops, it is true, and also far polar regions where the climate was too cold to allow any vegetation to grow, but all between was forest land. Each zone, then, must have had its own particular kind of trees, and to-day, in the forests which remain, the same differences of type are noticed. Soil and climate are the great factors in determining not only whether land shall be grassland or forest, but in determining what kind of forests shall grow in certain localities. And of climate conditions moisture is by far the most important. Given a sufficient rainfall, no matter how this may be distributed throughout the year, a forest will grow; and only in regions of very heavy rainfall are such dense, luxuriant forests as those of the Amazon country possible.

Of the various kinds of forests, there are three which are most important to people in temperate zones. In the cooler regions are to be found those huge groves of cone-bearers, which the scientist calls *conifers*—the pines, spruces, firs and hemlocks which are so dominant a feature of the Northern United States and Canada. Growing among them, and lighting up in the autumn with their marvelous tints the gloom of the evergreen shade, are frequently to be found beech, birch and maple trees in profusion.

In the warmer temperate regions flourish the familiar "woods" of oak, maple, beech, chestnut and other hardwood trees, nowhere to be found in more typical form than in the Eastern United States and Southern Canada. These are all *deciduous* trees—that is, they shed their leaves at the approach of winter; for only in their naked, leafless state can the trees present to the dry winter winds an evaporation surface sufficiently small to enable them to live.

The third type of temperate-region forest is not so widespread as these two, but is found in abundance in coastal regions. It, too, is made up of evergreen trees, but its evergreens have not the narrow, needle-like leaves of the cone-bearers. Some of the forests of California, with their madroñas and strawberry trees, illustrate this type.

Where Forests Grow To-day. Of its original forest growth every continent still possesses large tracts, and almost every country in the world has some forest never touched by the hand of man. The heaviest forests are found in South America, along the Amazon, where the jungle with its undergrowth and its climbing, intertwining vines is so dense that passage through it is impossible. Africa has a forest area almost as rich, but nothing like these two areas exists in any of the more thoroughly explored continents. Of the countries of Europe and North America, Canada has the largest forest area—over 600,000,000 acres; but Sweden, with 50,000,000 acres, has the largest proportion of its surface under trees—forty-eight per cent. The United States has 550,000,000 acres of forest land, or about twenty-five per cent of its total area. Great Britain, with 3,000,000 acres of woodland, has the smallest proportionate amount of any important country—only four per cent—but Switzerland has a smaller actual amount—2,000,000 acres.

The Deforesting of Land. The first comers to most lands have found them forested.

The woods against a stormy sky
Their giant branches tossed,

says the familiar poem that tells of the landing of the Pilgrims in North America. And to make themselves houses, to fit the land for agriculture, they had to cut down the forests. Then, too, extensive woodlands near new and feeble settlements have always been a source of danger, so easily might animals or savage enemies lurk in their shadows. There were other reasons, too, for cutting down forests—economic ones—because wood was needed for fuel, for furniture, for ships, for almost numberless things; and new uses constantly developed. In addition to all this, in every wooded region which has been settled inestimable quantities of wood have been wasted—burned just to get it out of the way; and the time came in the history of almost every nation when it became evident that sooner or later, if the original policy were persisted in, there would be a sad lack of forest areas.

Value of Forests. Wherein lies the great value of forests? Some points are so obvious that they scarce need mention—the fuel and lumber aspects, for instance, and the use of wood for a thousand other things. But if there were no wood to be had its place could now be taken fairly well by other substances. Concrete is being used increasingly in building; the newest and finest ships and railway cars are of steel; coal, gas and electricity offer solutions of the fuel problem.

The utility of forests is not confined to their value as logs or lumber after they are cut down; it is just as great when the trees remain rooted in the soil. Everyone recognizes the beauty of forests, every variety having its special charm; and everyone realizes the protection which the sheltering trees give to flowers, to birds and to other animals. The economic value, however, is not evident on the surface, and for that reason men did not discover it for a long time—in some instances until it was too late to remedy the damage done.

First of all, forests prevent rapid evaporation, and so tend to equalize moisture. In perfectly open country the streams carry off the water as soon as it falls, but in forest country the heavy mat of dead leaves and underbrush holds it and allows it to flow off gradually. The streams which have no forests near their sources and near the sources of their tributaries are certain to be of the type which dries up, wholly or partly, during the seasons of no rainfall, but in the rainy season is subject to sudden floods. Years ago, before all this was understood, the trees were cut from about the mountain sources of certain rivers of Southern France, and now the spring freshets work great damage each year.

Related to this is the part forests play in preventing erosion by lessening the rapidity of streams—a work of great importance when it is considered that in various parts of the world millions of acres of once valuable agricultural land have been literally eaten away by rushing rivers (see EROSION). Then, too, trees are a protection against wind, and also do the farmer a real service by housing the birds which are among his best friends because they help to protect his crops from insect enemies.

As stated above, almost every country in the world at some stage of its history has come to realize that it was wasting its forest wealth, and first one and then another made more or less formal and effective plans for forest preservation. Gradually there was evolved a regular science of the growth and management of trees—a science which received the name of *forestry*.

Forestry

Aims and Methods. Though its object, broadly stated, is very definite—to care for forests and make the most of their products—the problem of forestry presents many difficulties. While it seeks to prevent the present generation from despoiling the future of that which is its right, it must avoid the opposite error of saving for the future at the expense of present welfare. That is, it is not simply a matter of forest preservation. The government of a country could not simply decree that no trees were to be cut, and so solve the whole question, for trees must be cut constantly to meet imperative needs. But there should be other forests growing up to take the place of those which are being cut down, and the work undertaken by the forestry service in various countries includes the preservation of forests, the reforestation of areas which have been cut over, the planting of regions which have before been treeless, the prevention of forest fires, the setting aside of forest reserves and the reformation of wasteful methods of lumbering.

Forest creation is one of the most interesting phases of the work, and in it two main methods are employed. Such trees as oaks, birches, chestnuts, elms—most of those hardwood trees which lose their leaves in the fall—will grow *in coppice;* that is, when they have been cut they will send up shoots from the stumps, some of which shoots will reach, in the course of a generation, a fair size. The cone-bearing trees, however, and all others which do not sprout well, are grown from seed, either starting life in a nursery and being transplanted or growing from the first on the area set aside for them. Larger trees can be obtained from seeding than from coppicing.

In the United States. Scientists had realized for years that the United States was in a fair way to exhaust its forest resources, and occasional spasmodic laws were passed to prevent this; but not until 1891 did the country have anything like a national policy. In that year a law was passed authorizing the President to set aside forest areas as *national reserves,* while a change was made in the laws relating to the management of government timber land. The Division of Forestry, created in 1880 under the Department of Agriculture, and becoming of ever-increasing importance, was made, in 1901, the Bureau of Forestry, and in 1905 was reorganized as the *Forest Service,* with greatly enlarged powers. All the phases of forestry enumerated above the Service attends to, and in addition it gives assistance to individuals and to state governments in developing and protecting their forests. By no means the least of its achievements has been its successful campaign against forest fires, formerly a frightfully destructive agency; for it is estimated that since the settlement of the United States fire has destroyed more timber than has man; and this gigantic loss the Forest Service has practically eliminated.

National Reserves. These are not literally *reserves* in the sense of being withheld from use, but they are very carefully managed so that the greatest possible good will come from them. The privilege of cutting a certain number of trees within the reserve each year is usually leased to individuals, but the methods to be employed are clearly specified, and the trees which may be cut are designated by authorized forest rangers. At present there are in the United States over 160 national forests, with a total of 164,068,393 acres, most of this area being west of the Mississippi River. In very recent years considerable land has been acquired by the government in the White Mountains and the Southern Appalachians, the object being to prevent the deforestation of stream sources.

In Canada. Canada has at the head of its very efficient forestry service a Director of Forestry, who works under the Department of the Interior. His problems are similar to those of the Forest Service of the United States rather than to those of the foresters of Europe, for the forests of the two American countries are far vaster than those in Europe. Patroling the huge forest districts of the Dominion are rangers, who, like those of the United States, have sole right to designate the trees which may be cut and who with their subordinates have done remarkable work in preventing forest fires.

Under the Dominion government there are thirty-one national forests, the total area of which is 23,017,504 acres; more than half of this is in one great reserve, Rocky Mountains Forest Reserve, in the province of Alberta. But this total is far from representing all the public forest land in Canada, for several of the provinces control great reserves, those of Quebec having an area of 111,401,280 acres. All in all, there is a reserve area of 147,200,000 acres, or almost one-fourth of the total forest region of the country. A.MC C.

Consult Green's *Principles of American Forestry;* Roth's *First Book of Forestry.*

Related Subjects. The following articles in these volumes contain much information that will be of interest in connection with the above. The articles on the various important countries may also be consulted.

Climate
Conservation
Erosion
Glacier National Park
Lumber
Parks, National
Rocky Mountains Park
Tree (see list)
Yellowstone National Park
Yosemite National Park

FORGERY, *for'jer i,* the act of making or altering in the slightest degree any written instrument, for the purpose of deceit or fraud. Before conviction can be secured an intent to defraud must be shown; it is not required that anyone should have been injured, but that the forged instrument may be hurtful or prejudicial is sufficient proof. The punishment of forgery is either fine or imprisonment. In the different states of the American Union and the Canadian provinces the penalty varies, the statutes in some cases having been enlarged to include acts which were not formerly punishable as forgery.

Forgery is most common in connection with signatures to important documents, and especially with respect to checks, whose amounts may be largely increased by skilful and unlawful work with a pen. In common speech this latter crime is known as "raising a check." See CRIME.

FORGET-ME-NOT, the dainty, meek flower of an herb common in the United States, Southeastern Canada and England. Some species grow in ditches and damp meadows; others are found only in dry places. For most successful cultivation a cool, moist soil is best. The species most often seen has lancelike, downy leaves on a weak stem, with loose clusters of small, five-petaled, sky-blue flowers with yellow eyes. The flower buds are pink.

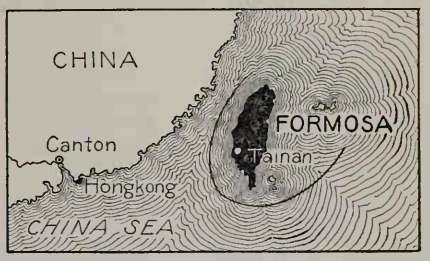
The sweet forget-me-nots,
That grow for happy lovers.
—TENNYSON: *The Brook.*

One species cultivated in greenhouses and valued for its brilliancy is the dark-blue forget-me-not of the Azores. Another species, with short, soft leaves, gave this genus of plants the Greek name *Mtosotis,* meaning *mouse-ear.* In England the forget-me-not is sometimes called *scorpion grass,* but in many languages the name of this plant is the same—forget-me-not.

In the language of flowers, the forget-me-not stands for remembrance, and it is a symbol of friendship, the world over. In Longfellow's *Evangeline* he speaks of the stars as "the forget-me-nots of the angels." It is a favorite flower with painters. See FLOWERS.

FORMALDEHYDE, *fawr mal' de hide,* a compound of carbon, hydrogen and oxygen, discovered by A. W. Hoffman in 1867. It may be obtained in several ways; one popular method is by leading a mixture of vapor of methyl-alcohol and air over a heated platinum spiral. The solution is the commercial *formalin.* The chemically pure article is unknown. Formaldehyde is a powerful disinfectant, and it is used also in the manufacture of certain dyes.

FORMOSA, *fawr mo'sa,* called TAINAN by the Japanese, who took it from China, is an island in the Chinese Sea, separated from the mainland of China by a strait about ninety miles wide in its narrowest part. It covers an area of 13,429 square miles, and is therefore



FORMOSA
The curved line separating the island from the mainland marks Japan's line of ownership.

larger than Maryland. The island is noted for the majestic beauty of its scenery, to which it owes the name *Formosa the Beautiful,* given to it by early Spanish navigators.

The soil is extremely fertile, and cereals are produced in abundance, but tea is the most important product. Much of the tea imported into the United States and Canada comes from Formosa, those two countries taking practically all of the island's crop. This was formerly shipped to Chinese ports, where it was repacked and forwarded, but now there is direct communication between Formosan ports and North America. Corn, sugar, pepper, camphor, indigo, hemp and timber are also exported, the principal trade being with China, Great Britain and the United States. The inhabitants are for the most part of Chinese and Malay descent, but there are still numbers of aboriginal savage tribes inhabiting the interior.

The chief town is Tainan, but more than seventy-five per cent of the commerce passes through Tamsui, the port at the mouth of the Tamsui-yei River. Formosa was ceded to Japan in 1895 after China's defeat in the Chinese-Japanese War (which see), and is administered by a governor, who is subject to the imperial authority of Japan. Population officially estimated in 1913, 3,512,607.

FORMS OF ADDRESS'. See ADDRESS, FORMS OF.

FOR'REST, EDWIN (1806-1872), a famous American actor who honored his profession in life, and upon his death left a large portion of his ample estate to found a home for aged and destitute men and women of the stage. He was born in Philadelphia, where, in 1820, he made his initial appearance in the title rôle

of Home's *Douglas*. His first real triumph was in 1826 in *Othello*. In 1836 he appeared in London as Spartacus in *The Gladiator*. Other notable rôles include Virginius, Damon and Lear. His last professional appearance was in 1871.

FORT. See FORTIFICATION.

FORT COLLINS, COLO., the county seat of Larimer County, is in the northern part of the state, on the Cache la Poudre River and on the Union Pacific and the Colorado & Southern railroads. The population in 1910 was 8,210; in 1916 it was 11,451. Fort Collins occupies an area of over two square miles, on a sandy plain near foothills of the Rocky Mountains. It is the seat of the state agricultural college, in connection with which is a government experiment station. The city has a Federal building, courthouse, Carnegie Library, hospital and parks. Sugar beets, potatoes, alfalfa and wheat are important crops of a large surrounding irrigated district, and the city has a large sugar-beet factory.

Fort Collins adopted the commission form of government in 1913.

FORT DEAR'BORN, a fort built in 1804 on the site of the present city of Chicago, and famous for the massacre which occurred there on August 15, 1812. On that day the garrison of sixty-seven men, commanded by Captain Heald, evacuated the fort under orders from General Hull from his headquarters in Detroit. Accompanied by thirty settlers, including women and children, and escorted by a band of Miami Indians, he started for Detroit. At a short distance from the fort (near the eastern end of the present Eighteenth Street), they were attacked by a large number of savages, who were joined by most of the escort. Two-thirds of their number were killed, and the rest were captured. The fort was destroyed by the Indians on the following day, was rebuilt about 1816 and razed in 1856. A monument marks the spot of the massacre; it stands about five hundred feet from Lake Michigan.

FORT DEARBORN

Fort Dearborn was named in honor of General Henry Dearborn, a prominent figure in the War of 1812.

FORT DODGE, IOWA, the county seat of Webster County, is in the northwestern part of the state, eighty-five miles north and west of Des Moines and 135 miles east of Sioux City. It is on the Des Moines River and on the Illinois Central; the Minneapolis & Saint Louis; the Fort Dodge, Des Moines & Southern, and the Chicago Great Western railroads. A long steel railway bridge crosses the river at this point. The population was 15,543 in 1910 and 20,648 in 1916. The area of the city is nearly four square miles.

Fort Dodge is the seat of Tobin College. It has a Federal building, courthouse, Carnegie Library and Oleson and Reynold's parks. The city is a trade center for a rich farming country, and in the locality are an extensive gypsum bed and deposits of coal, glass sand, clay and brown sandstone. The wholesale trade is extensive. Railroad shops of all four roads entering the city are located here, and other establishments are greenhouses, boiler works and foundries, and manufactories of gypsum and clay products, brick and tile, plaster, oatmeal and shoes.

Settled in 1854 on the site of a fort built four years previously as a protection against the Indians, Fort Dodge was chartered as a city in 1869. In 1911 the commission form of government was adopted.

FORT DONELSON. See FORT HENRY AND FORT DONELSON.

FORT DUQUESNE, *du kane',* a fort erected by the French in 1754 at the junction of the Allegheny and the Monongahela rivers, around which, in 1764, the city of Pittsburgh was laid out. It was an important French military station, was the objective of numerous attacks by the English, and was finally captured by them in 1758. At the suggestion of General Washington, its name was changed to Fort Pitt, in honor of William Pitt, prime minister of England. The old block house built by General Bouquet in 1763 still stands. See PITTSBURGH.

FORT FRANCES, *fran'ses,* the principal town of the Rainy River district, Ontario, a lumbering center and headquarters for hunters and fishermen. It is situated in the extreme western part of the province, on the north bank of Rainy River, which at this point is the boundary between Ontario and Minnesota. On the Minnesota side of the river is the town of International Falls. Fort Frances is 174 miles northwest of Duluth, 207 miles southeast of Winnipeg and 232 miles west of Port

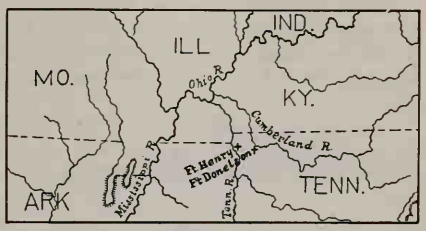
Arthur. It is on the main line of the Canadian Northern Railway, and at International Falls has connection, through the Minneapolis & International Railway, with the Northern Pacific and other railways in the United States. Fort Frances is the terminus of several steamship lines whose small vessels traverse Lake of the Woods, Rainy River and Rainy Lake, one-half mile east of the town. Large lumber mills, in which from 600 to 800 people are employed, pulp and paper mills and planing mills are the principal industrial establishments. Nearly all nationalities are represented in the population, which in 1910 was 1,611; in 1916 it was estimated at 2,000.

FORTH, a river and firth, or estuary, in the east of Scotland. The river is formed by the Duchray Water and the Avondhu River, which rise in the slopes of Ben Lomond in Stirlingshire and unite about a mile from the town of Aberfoyle. The actual length of the river is sixty-six miles, though the distance from its source direct to the sea is only about thirty miles. From the town of Kincardine to the North Sea, a distance of forty-eight miles, the river is known as the Firth of Forth, one of the finest natural harbors in the British Isles. It varies in width from one and a half miles at Kincardine to seventeen and a half miles at the mouth. The oyster beds for which the Firth of Forth was long noted are greatly diminished in value, but there are still many important fishing centers on both coasts.

Forth Bridge, a railway bridge one and a half miles long, crossing the Firth of Forth. It is built on the cantilever principle, and is regarded as one of the most remarkable bridges in the world. The actual length is 8,295 feet, over one and a half miles; it has two main spans of 1,710 feet, two arms of 680 feet, fifteen spans of 168 feet and seven small arches. The center of the bridge is 152 feet above high water, the extreme height of the towers being 361 feet. The bridge was completed in 1889 at a cost of $13,000,000.

FORT HENRY AND FORT DONELSON, two forts of the War of Secession in America, constructed by the Confederates in 1861 south of the boundary line between Kentucky and Tennessee. The former was located on the right bank of the Tennessee River, and the latter on the left bank of the Cumberland, the distance between the two being about twelve miles. They were important, for they controlled the entrance into Tennessee and the states farther south.

On February 6, 1862, a fleet of gunboats under Commodore Foote attacked and captured Fort Henry. Most of the Confederates escaped to Fort Donelson, which, thus reënforced, at first successfully withstood the attack of the land troops under General Grant, but



LOCATION OF FORTS HENRY AND DONELSON

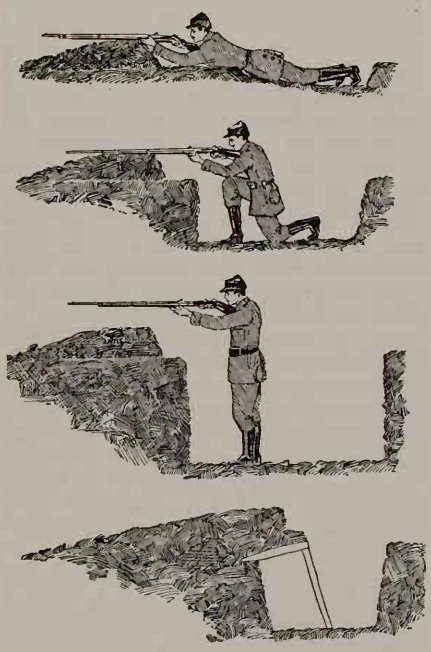
later began to weaken. During the next night Generals Floyd, Pillow and Forrest, with 2,000 men, escaped, leaving the command to General Buckner, who, on the following day, recognizing the situation as hopeless, offered to surrender on certain conditions. These were rejected by General Grant in his now famous words, "No terms but unconditional and immediate surrender can be accepted." General Buckner then surrendered 15,000 men, and a large amount of ammunition and stores. This was the same General Buckner who, in 1896, was the candidate for President of the United States on the Gold Democratic ticket, as a party protest against the "free silver" candidacy of William Jennings Bryan.

FORTIFICATION, *for ti fy ka'shun,* a term applied to the art of strengthening military positions, and also to the earthworks, fort, fortress or other engineering device used for defense. Modern scientific fortification dates from the reign of Louis XIV of France (1638-1715), during which time the distinguished engineer, Vauban, devoted many years to the erection of permanent fortresses sufficiently strong to withstand the attacks of the most powerful artillery then known. The object of fortification is to give protection to troops so that they may, while themselves under cover, repel attacks of troops in superior numbers who must advance against them along comparatively open ground.

For military purposes fortifications may be classed as *permanent* or *temporary.* Permanent fortifications are erected to defend a town, harbor, arsenal or some particular point that may be an object of attack. In planning such fortification the nature of the surrounding ter-

ritory must be carefully considered. The defenses must be erected so that every approach is guarded, and planned in such a manner that the various parts of the fortification may be able to support each other by gun and rifle fire.

Temporary fortifications are prepared to afford protection to troops wherever they may be in war time. These consist chiefly of trenches, barbed wire entanglements, felled



QUICKLY-CONSTRUCTED TRENCHES

At top, typical lying-down trench, made under fire of the enemy. Second, a shallow trench, furnishing shelter for kneeling soldier. Third, a complete standing trench. At bottom, form of construction of cave shelter, which, though crude, possesses comfortable features. See other illustrations of trenches in article WAR OF THE NATIONS.

trees, and in fact anything available which will retard the advance of hostile troops. Modern warfare has proved that forts such as were erected by Vauban, consisting of huge earthworks, surrounded by a moat or ditch, and of late years greatly strengthened by steel and cement, cannot withstand present-day artillery. The forts of Liége and Antwerp, considered the strongest ever built, crumbled beneath the mighty sheils of the German howitzers at the beginning of the War of the Nations, in 1914. Steel and cement are giving way to earth and sand, and fortresses, instead of standing out boldly are now being made as nearly invisible as possible. A fort, the range of which has been accurately ascertained, can withstand attack but a few hours, or a few days, at most. Forts in which big guns may be moved from place to place are more valuable than those in which the guns retain a more or less fixed position; an earthwork, consisting of hastily thrown-up mounds, behind which guns may be hidden, is then more effective than the strongest structure of steel and concrete that human ingenuity has yet erected.

Early in the War of the Nations it was found that the most satisfactory fortifications that could be constructed were series of trenches connected with each other by zigzag passages. In such trenches a few determined men could resist the assaults of far superior numbers, and only after severe bombardment by heavy guns could a successful advance against them be achieved.

Contrasting the quick reduction of the great fortifications in the War of the Nations with the long sieges required to destroy forts in former wars, it is possible to estimate the terrible energy of modern guns. Some historical data is given in the article SIEGE. See, also, WAR OF THE NATIONS.

FORT MADISON, IOWA, county seat of Lee County, is a city on the Mississippi River, in the southeastern corner of the state. It is nineteen miles south of Burlington and twenty-five miles north of Keokuk. Saint Louis is 202 miles down the river. Fort Madison is on the Atchison, Topeka & Santa Fe and the Chicago, Burlington & Quincy railroads and is a port for upper river and local packet steamers. The area of the city is nearly six square miles. The population in 1910 was 8,900; the state census of 1915 reported 9,507.

Since the completion of the power dam at Keokuk (see KEOKUK DAM), the development of Fort Madison, which is within the power zone, has been rapid and substantial. Since 1914, four large factories have located here, a new street railway has improved the local system, the city has granted new water and gas franchises and has appropriated large sums for paving streets, laying sewers, etc. The building of an interurban railway through a fertile and productive farming region to the old Mormon town of Nauvoo, ten miles south in Illinois, is one of the new projects to be undertaken.

Among the more prominent buildings are the Federal building, erected in 1913 at a cost of $75,000; the German-American bank building, erected in 1916 at a cost of $110,000; Cottermole Memorial library, and the Santa Fe and Sacred Heart hospitals. The state penitentiary is located here. There are four public parks. From the bluffs the views up and down the river are attractive. There is a fine railroad and wagon bridge across the Mississippi.

The industrial establishments are a packing house, shops of the Atchison, Topeka & Santa Fe Railroad, whose monthly pay roll is $70,000, grain elevators, brick works, cement-block works, foundries and machine shops, wrapping-paper mills and plow factories.

A stockade fort was built on the site of Fort Madison in 1805; in 1813 it was destroyed by fire. A permanent settlement was made in 1833; the town was chartered in 1836 and became a city in 1839. J.J.H.

FORT MIMS, MASSACRE OF, an Indian massacre on August 30, 1813, at Fort Mims, thirty-five miles north of Mobile, Ala. At the outbreak of the Creek War 553 men, women and children had assembled in the garrison for protection. They were attacked by a large band of savages and in spite of their brave resistance all but fifteen were killed.

FORT MONROE or **FOR'TRESS MONROE,** a fort on Old Point Comfort, at the mouth of the James River, Virginia, commanding the entrance to Hampton Roads. It is the headquarters of the coast defenses of Chesapeake Bay, and is the location of one of the largest military posts in the United States. It occupies a reservation of 282 acres ceded by Virginia in 1818 to the Federal government.

FORT MOULTRIE, *mohl'tri,* a fort on Sullivan Island, at the main entrance to Charleston Harbor, South Carolina, formerly known as Fort Sullivan. It was famous for its defense against the British in the Revolutionary War. In 1776 a force of English troops under Sir Henry Clinton and a fleet under Sir Peter Parker arrived at Charleston Harbor with the intention of occupying Charleston and operating from there against the Southern colonies. An American force of 6,500, under Colonel Moultrie, was stationed at Fort Sullivan, at the eastern end of Sullivan's Island, and successfully defended Charleston. The Southern states were thus temporarily freed from invasion. The name of the fort was subsequently changed to Fort Moultrie. On May 7, 1780, it was seized by the British. At the outbreak of the War of Secession it was occupied by a United States garrison, but fell into the hands of the Confederates when Major Anderson abandoned it for Fort Sumter in 1861. See FORT SUMTER.

FORT NIAG'ARA, a fort formerly at the mouth of the Niagara River, on the American side. La Salle built a rude structure here in 1669, and ten years later he constructed a fortified trading post on the same site. In 1725 the Frenchman, Vaudreuil, erected Fort Niagara, which soon became the most important military and trading center on the Great Lakes. In 1759 it was attacked and captured by the British under Sir William Johnson, but was returned to the Americans in 1796, in accordance with the treaty of 1783. In 1813 it was attacked and captured by the British, and again given back to the Americans at the close of the War of 1812. In 1826 it had ceased to be important as a military center, and the United States troops were withdrawn. Later it was demolished.

FORT SCOTT, KAN., the county seat of Bourbon County, in the southeastern part of the state, is five miles west of the Missouri state line and ninety-seven miles south of Kansas City. It is on the Marmaton River, and on the Saint Louis & Kansas City; the Missouri, Kansas & Texas and the Missouri Pacific railroads. The area is four square miles. In 1910 the population was 10,463; in 1916 a Federal estimate gave 10,550. The city has a Federal building, built in 1889 at a cost of $120,000, a Carnegie Library and Mercy Hospital. There are paved streets, three parks, and splendid roads throughout the surrounding country. Near the town is a national cemetery.

Fort Scott is the trade center for a rich agricultural section, in which dairying is an important industry. There is much mineral wealth in the vicinity, including bituminous coal, in which there is a large trade, oil and gas, cement, rock, lead and zinc. Sulphur water is obtained from artesian wells. The principal industrial establishments are large railroad shops, a syrup factory, an overall factory and manufactories of cement, pottery, tile, leather goods and medicines.

Fort Scott was established by the Federal government in 1842 in what was then Indian Territory. The fort was abandoned in 1855. A settlement was organized in 1857, and it became a city in 1860. The commission form of government was adopted in 1914. H.A.R.

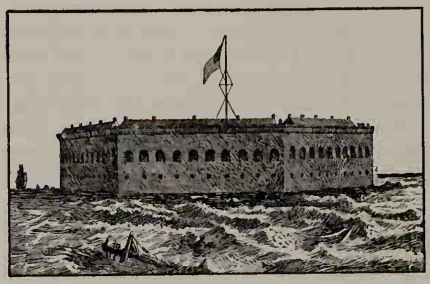
FORT SMITH, Ark., the county seat of Sebastian County, north of the center of the state, on the western state boundary line, 165 miles northwest of Little Rock, the state capital. It is in the Ozark Mountains, and on the Arkansas River, at the mouth of the Poteau River, and on the Saint Louis & San Francisco, the Arkansas Central, the Midland Valley, the Kansas City Southern, the Fort Smith & Western, and the Saint Louis, Iron Mountain & Southern railroads. Transfer and shipping are promoted by a belt line within the city. The street car service is extended by interurban electric line to Van Buren. The population in 1910 was 23,975; in 1916 it was 28,638, by Federal estimate. There are many Germans and Irish among the population.

The rivers are crossed at this point by four steel bridges. The city has a Federal building, erected in 1890 at a cost of $250,000; a Carnegie Library, a Union Station, Masonic Temple and several noteworthy bank buildings and churches. In addition to the public schools, which include a high school buildiug costing $500,000, Fort Smith has a German Lutheran School and Saint Anne's Academy. Electric Park contains seventy-five acres; Cliff Drive is an oiled automobile road forty miles in length.

Fort Smith is in a rich agricultural section where two crops a year is the rule. Cotton, sorghum cane, sweet and Irish potatoes, grain, hay and fruits are raised. Near the city are forests of yellow pine, oak, hickory, etc. Manufactories are fostered by an abundant supply of natural gas and smokeless coal, both found in the vicinity. Industrial enterprises include cotton compresses, cottonseed-oil mills, smelters, a sorghum syrup mill, canning plant, oil refinery, coffee roasting and extensive manufactures of wagons, stoves, wheelbarrows, drays, chairs and every kind of furniture, saddles and harness, vitrified paving brick, crackers, peanut butter, etc. The shipping of cattle and hogs and agricultural and manufactured products constitutes an extensive commerce.

Fort Smith was built as a United States army post in 1817, and until the post was abandoned in 1871 it was the chief depot of the western forts. The town was organized in 1821, incorporated in 1842 and became a city in 1845. Near the old fort, which was the scene of several engagements in the War of Secession, is a National cemetery. The city adopted the commission form of government in 1913. G.S.

FORT SUM'TER, a fort in the harbor of Charleston, S. C., four miles southeast of the city, and distinguished as the scene of the first engagement in the War of Secession. At this period the national defenses in Charleston



FORT SUMTER
Before the bombardment in 1861.

harbor were in charge of Major Robert Anderson, whose headquarters were in Fort Moultrie. In 1860, South Carolina seceded and prepared to seize the United States forts in the harbor. Major Anderson, believing he was about to be attacked and realizing the weakness of Fort Moultrie, abandoned it and made Fort Sumter his headquarters. In April, 1861, he refused to surrender to General Beauregard, who vigorously bombarded and captured the fort on the thirteenth day of that month. Major Anderson and his command were permitted to leave the fort with honors of war. Sumter was held by the Confederates until the evacuation of Charleston in February, 1865, and in the following April the same flag that had been lowered in 1861 was raised over it with impressive ceremonies. See Fort Moultrie.

FORTUNA

FORTU'NA, in Roman mythology, was the goddess of chance, corresponding to the Greek *Tyche*. She differed from Destiny, or Fate, in that she dispensed joy or

sorrow at her own pleasure, and without regard to law. In Italy she was worshiped from a very early period, and had temples at Antium and Praeneste. In Greek art she is usually represented with a rudder, indicating her guiding power; with a cornucopia, as a symbol of prosperity, or with a ball, wheel or wings, typifying her fickle character. The English word *fortune* is therefore understood.

FORT WAYNE, IND., the county seat of Allen County, is a railroad center and manufacturing city in the northeastern part of the state, 102 miles northeast of Indianapolis and 150 miles nearly east of Chicago. It is on the Saint Joseph and Saint Mary's rivers, which continue from their junction within the city as the Maumee River, and on the Fort Wayne, Cincinnati & Louisville; Pennsylvania; Grand Rapids & Indiana; New York, Chicago & Saint Louis; Wabash and New York Central railroads. There is also interurban electric service. The area of the city is eleven square miles. In 1910 the population was 63,933; in 1916 it was 76,183, by Federal estimate.

Public Buildings and Institutions. Fort Wayne has a Federal building; a county courthouse, completed in 1902 at a cost of $1,000,000; a public library, costing $100,000, of which amount Mr. Carnegie donated $90,000; Saint Joseph's, Hope and Lutheran hospitals; a high school building, erected at a cost of $300,000, and several noteworthy churches. In Lawton Park (thirty-one acres) is a monument erected in honor of Major-General Henry Ware Lawton, who was killed while fighting in the Philippines. Other parks include Lakeside (twenty-two acres) and the smaller parks, Reservoir, Piqua and Old Fort, the last named being the site of Old Fort Wayne. The educational institutions include Concordia College (Lutheran), a college of medicine and surgery, a conservatory of music, a school of art and a school of oratory, expression and physical culture. Among the larger charitable institutions are the Indiana School for Feeble-minded Youth and several orphan asylums.

Industry. Fort Wayne is the distributing center of an extensive agricultural district. It has large shops of the Pennsylvania and the Wabash railroads, and among the important manufactures are Corliss and other steam engines, locomotives, freight and passenger cars, car wheels, boilers, electrical machinery, electrical fittings and fixtures, organs and pianos and many others of lesser importance. About 10,000 operatives are employed in the various industries, and the manufactured products have an annual value in excess of $15,000,000. Wholesale and jobbing houses distribute dry goods, groceries, hardware, drugs, millinery, paper and other commodities valued at $10,000,000 yearly.

History. Kekionaga, the principal village of the Miami Indians, was formerly within the present limits of Fort Wayne. A stockade fort, now the site of Old Fort Park, was built in 1794 by General Anthony Wayne. In 1813 it was besieged by Indians, who were routed after a hard fight. Six years later the fort was abandoned. A permanent settlement was made in 1815 and until 1830 it was an important fur-trading post. The town was incorporated and made the county seat in 1824, and in 1840 it became the city of Fort Wayne.

FORT WILLIAM, a city in the Thunder Bay district, Ontario, is a distributing point of importance. It is situated at the head of navigation on Lake Superior, at the point where it receives the waters of the Kaministiquia River, and three miles southwest of Port Arthur, with which it has steam and electric railway connection. Winnipeg is 419 miles northwest, and Montreal is 992 miles southeast, by rail; Duluth is 180 miles southwest, Sault Sainte Marie is 237 miles southeast, and Montreal is 1,056 miles also southeast, by water. Fort William is a meeting point for the Canadian Pacific, Canadian Northern and Transcontinental railways, and is a port of call for all passenger and freight steamer lines on the upper lakes. The Mount McKay and Kakabeka Falls Railway, built and operated by local capitalists, runs from Fort William to Kakabeka Falls, where water power for the city is developed.

Fort William was established as a Hudson Bay post in 1805, and was named in honor of William McGillivray, then chief factor of the Hudson's Bay Company, but it was not incorporated as a city until 1907. With the development of the Canadian Northwest, the city's growth has been rapid. The population increased from 3,633 in 1901 to 16,499 in 1911; in 1916 it was estimated at 20,000. Of this number about 10,000 are Canadians, the remainder being chiefly United States citizens, Finns, Swedes and Norwegians.

Fort William is located in a district rich in timber and agricultural products, especially grain; silver, copper and iron ores are also found here. Through excellent shipping facilities by water and by rail, the city and Port

Arthur, its neighbor, became the reshipping points for the great bulk of freight passing into and out of Western Canada. In Fort William alone there are eighteen grain elevators, with a total capacity of 30,000,000 bushels. The leading industrial establishments are large flour mills, having a daily output of about 15,000 barrels, stove and car-wheel foundries, breweries, shipbuilding yards, factories for making various kinds of building supplies, and plants for making heavy iron and steel implements.

Noteworthy buildings are the post office and custom house, the $85,000 city hall, erected in 1905, and the public library. The park reservations cover 125 acres. Points of interest in the vicinity are Mount McKay, Kakabeka Falls, 120 feet high, and Sleeping Giant, or Thunder Cape, eighteen miles across Thunder Bay. A.MC N.

FORT WORTH, Texas, the county seat of Tarrant County, is a rapidly growing shipping and manufacturing center, in the northeastern part of the state. In 1876 there were fewer than 1,000 inhabitants. By 1910 this number had increased to 73,312 and in 1916 to 104,562, by Federal estimate. The city has an area of more than sixteen square miles.

It is attractively situated on an elevated plain at the junction of forks of the Trinity River. Dallas is thirty miles east, Austin 175 miles south, and El Paso 615 miles west and south. It is on the Texas & Pacific; the International & Great Northern; the Chicago, Rock Island & Gulf; the Gulf, Colorado & Santa Fe; the Fort Worth & Denver City; the Saint Louis Southwestern (Cotton Belt); the Saint Louis & San Francisco; Missouri, Kansas & Texas and the Sunset-Central Lines. In addition to these there are two electric interurban lines.

Buildings and Parks. The Federal building, Tarrant County courthouse, built of granite and marble from Texas quarries, the city hall, Central High School, union railway station, Coliseum and the Chamber of Commerce Auditorium are the noteworthy structures. There are twenty-one parks, varying from one-half acre to 113 acres in area. About the city are unexcelled hard-surfaced country roads.

Educational Institutions. Fort Worth is the seat of the Texas Christian University, with which in 1913 was united the Fort Worth Medical College; Texas Woman's College, the successor of the Polytechnic College (Methodist Episcopal); Baptist Theological Seminary; Southland University (state school of the Disciples of Christ); Saint Andrew's School (Protestant Episcopal); Saint Ignatius Academy (Roman Catholic); Masonic Orphans' Home and School for Texas, and a number of smaller denominational and technical schools. The city has a Carnegie Library, a law library and the medical college library.

Industries. Most of the trunk lines of Texas converge at Fort Worth, making the city one of the most important shipping centers of the southwest and a reshipping point for almost the entire state. Agriculture and stock raising are the supporting industries of the vast surrounding country. The grain handled annually by elevators and mills in Fort Worth is valued at over $35,000,000, and the cotton business exceeds $50,000,000 annually. The wholesale fruit and produce business amounts to $60,000,000.

Meat packing houses in 1914 slaughtered 1,985,426 animals; Fort Worth ranks well with the leading cities in this industry. Among the other important industries are included cornmeal and stock-feed mills, cotton and oil mills, railroad repair shops, foundries and machine shops, silo plants and many lesser manufactories. The city is an important horse and mule market.

In view of the possible failure of the water supply from a number of artesian wells, the city has constructed a large storage dam on the west fork of the Trinity River, seven miles distant. This work cost $1,500,000, and it has a storage capacity of thirty billion gallons.

History. In 1849 a military camp called Fort Worth was established on the present site of the city. The camp was abandoned, and a later settlement, which became the county seat in 1860, was incorporated in 1873. The fort and settlement were named in honor of General William Jenkins Worth. The commission form of government was adopted in 1907; the departments consist of five commissioners, mayor and tax collectors.

FO'RUM. When used without modification this word usually refers to the great Forum, the center of the life of ancient Rome. It lay in the hollow between the Palatine, the Quirinal and the Capitoline hills, and to it flocked the dwellers on those heights. Here, in the early centuries of the city's life, were the markets, where the farmers displayed their fruits and vegetables and the fish dealer his wares; here the political meetings were held,

and here the devout gathered to worship the gods. At first everything connected with the Forum was largely informal—it was merely an open gathering-place, often unpleasantly marshy. But as the city grew the Forum was leveled and drained by the great sewer known as *Cloaca Maxima;* shops were built about the edges, and temples began to spring up. Later the shops were banished to new market-places, and the Forum assumed an added dignity. The emperors delighted to ornament it

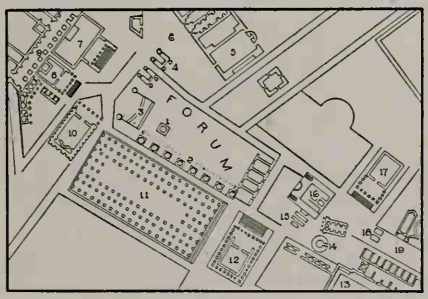


DIAGRAM OF THE FORUM

(1) Column of Phocas
(2) Bases of Honorary Statues
(3) Rostrum
(4) Arch of Septimius Severus
(5) Curia, or Senate House
(6) Comitium
(7) Temple of Concord
(8) Temple of Vespasian
(9) Tabularium, or Office of Records
(10) Temple of Saturn
(11) Basilica Julia
(12) Temple of Castor
(13) Atrium Vestae (House of the Vestals)
(14) Temple of Vesta
(15) Arch of Augustus
(16) Temple of Julius
(17) Temple of Antoninus and Faustina
(18) Arch of Favius
(19) Via Sacra

with buildings, arches and statuary, and in the days of the empire it was an imposing sight, with its pillared temples, its gleaming columns and its shaded walks. The illustration shows the location of the most prominent buildings.

It was not the architecture, however, which made the Forum the wonder of the ancient world, but the teeming life which flowed through it. Stately Romans in their flowing togas walked beneath its arches; dignified Senators hastened to it, intent on measures which might save or disrupt the empire; there was the echo of clashing arms from its walls, as soldiers returning victorious from some far province marched through it; and many a conquered enemy of royal rank was led captive under its arches. Here, in the Senate House, Cicero delivered those renowned speeches which overthrew Catiline; here Brutus made his defense after the death of Caesar, and here Mark Antony swayed the passions of the mob to vengeance and violence. The history of the world of that day was largely made here, for Rome was the all-important part of the world in those days of splendor.

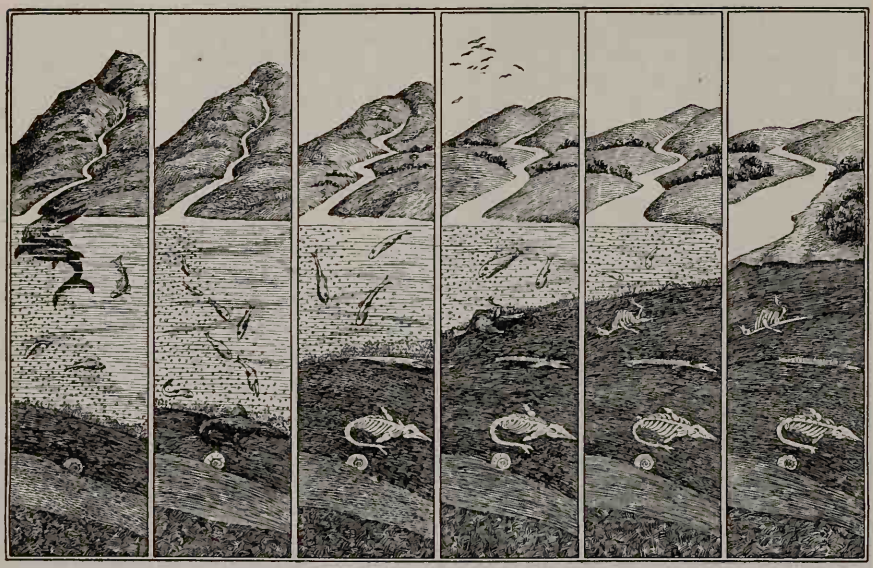
When the barbarians poured into Rome in the fifth century they spared the Forum, but later centuries were not so kind, and all during the Middle Ages the Forum was little more than a desolate waste, its buildings tumbled in ruins or buried under rubbish. Its condition is plainly shown by the fact that it was called Cow Plain. In recent years clearances and excavations have been undertaken, and some valuable relics have been unearthed.

Other Forums. The word *forum* means simply *out-of-doors,* or *market-place,* and was by no means restricted to the one open-air place described above. Rome itself had many more, several of the emperors setting aside and beautifying forums in their own honor. Julius Caesar began the custom, and Augustus, Vespasian, Domitian, Nerva and Trajan followed his example. Some of these had architectural beauties as great as those of the old Forum, but they never took the same part in the city's life, and it alone bore the title of *Forum Romanum.* Practically every Roman city, whether in Italy or in the colonies, had at least one forum, and no study of the life of ancient times is complete which does not give much attention to these great unifying, civilizing agencies. See ROME. A.MC C.

Consult Hülsen-Carter's *The Roman Forum;* Platner's *The Topography and Monuments of Ancient Rome.*

FOSSIL, *fos'il.* We sometimes find pieces of shell in a rock and look upon them as great curiosities. If we examine the rock more closely by using a magnifying glass, we may discover that it contains the remains of tiny animals that have turned to stone, that is, have *petrified.* These remains of plants and animals that have turned to stone are *fossils.* We may well look upon them as curiosities, for they tell us of the animals and plants that lived in the past geologic ages, long before man came upon the earth.

Fossils are of the greatest importance to the geologist, for it is by studying them that he is able to tell the order in which the different rock systems were formed. For instance, the rocks that contain no fossils must have been formed before either plants or animals could live on the earth. Again, it is reasonable to suppose that the simplest forms of life appeared first, hence the rocks in which fossils



WHY FOSSILS ARE FOUND IN THE EARTH

In the course of ages the hills wear away by erosion (which see) and their deposits fall to the bottoms of streams and lakes, gradually filling them up, or lessening their depths. Animals and plants die and are covered, and possibly in hundreds of thousands or millions of years evidences of them are discovered by excavation. The above illustration suggests but one of the means by which fossils are formed.

of these forms are found are believed to be older than those in which fossils of more complex forms occur. These studies lead us to believe that plants came into existence before animals, and that animals with a simple structure, like the shellfish and starfish, came before those of a more complex structure. The study of fossils tells us that there were no animals with backbones (vertebrates) before the Silurian Period, and that during the Devonian Period fishes reached their highest development. These were followed by reptiles, which in turn were followed by birds, and these by mammals, which were the forerunners of the animals of the present time. The fossils of animals are much easier to study than those of plants, because they are better preserved. The study of fossils forms the study of paleontology.

Related Subjects. The reader is referred to the following articles in these volumes:

Devonian Period	Paleontology
Geology	Silurian Period

FOSTER, John Watson (1836-1917), American diplomat of high rank, and a statesman and author, was born in Indiana. He was graduated at Indiana State University in 1855, admitted to the bar in 1857, and served in the Union army during the War of Secession. From 1873 to 1880 he was minister to Mexico, then for two years minister to Russia, and in 1883 minister to Spain. In 1892 he succeeded James G. Blaine as Secretary of State in the Cabinet of President Benjamin Harrison. In 1893 he was agent in the Bering Sea arbitration at Paris; in 1898 member of the Anglo-Canadian commission; in 1903 agent in the Alaskan Boundary Tribunal at London; and in 1907 was appointed delegate from China to the Second Hague Conference. Probably no other man in America has had a longer or more honorable public career in diplomacy. His son-in-law, Robert Lansing, became Secretary of State under President Wilson. His writings include *A Century of American Diplomacy, Diplomatic Memoirs* and *The Practice of Diplomacy.*

FOSTER, Sir George Eulas (1847-), a Canadian statesman, Dominion Minister of Trade and Commerce since 1911, the only member of the Borden Ministry who had previously held a Cabinet office, and the only man who has served under all the Conservative Premiers from Macdonald to Borden. His early years gave little indication of his later career. Born in New Brunswick, he attended

the University of New Brunswick, from which he was graduated in 1868. After pursuing his studies further at the universities of Edinburgh and Heidelberg, he returned to New Brunswick and for several years was a teacher, finally becoming professor of the classics at his *alma mater*. He resigned his professorship in 1879 and in 1882 entered political life as a Conservative member of the House of Commons.

In Parliament his scholarship and ready wit in debate won immediate recognition. In 1885 Sir John A. Macdonald appointed him Minister of Marine and Fisheries, a position which he exchanged in 1888 for that of Minister of Finance. He remained as Minister of Finance in the ministries of Macdonald's four Conservative successors, and after the defeat of his party in 1896 remained in the House of Commons as a member until 1900. In 1904 he was again elected to the House, and in 1911 was appointed Minister of Trade and Commerce by Premier Borden. King George in 1914 created him a Knight Commander of the Order of Saint Michael and Saint George. Sir George is known as an advocate of temperance, and as early as 1895 supported a resolution in Parliament for the extension of suffrage to women. He is also a strong Imperialist, and favors preferential tariffs within the empire. G.H.L.

FOSTER, Stephen Collins (1826-1864), composer of *My Old Kentucky Home,* prob-

FOSTER'S HOME

House in Bardstown, Kentucky, where *Old Kentucky Home* was written.

ably with the exception of *Home, Sweet Home* the most extensively-translated song in the world. Every part of Europe has a version of it, and even in Asia and Africa the natives have sung it in their own tongues. Over 400,000 copies of this song were sold five years after its publication; at the time it was a record never before equaled.

Without any formal training in music, he composed about 125 songs, more than any other man ever produced. Nearly a fourth of these are negro melodies and the remainder are sentimental ballads; both the music and words of all of them were of his own composition. It was generally supposed that no one not born in the South could produce negro melodies such as were composed by Foster, who was a native of Pittsburgh, Pa.

Foster was of a retiring nature and cared little for fame and money, but he could not escape popularity. It is said that for *The Old Folks at Home (The Suwanee River)* he received only $500; his publisher netted over $10,000 for his *The Louisiana Belle* and *Old Uncle Ned.* Other songs which brought him great fame are *Nelly Bly, Old Dog Tray, Way Down South Where de Cotton Grows, Gentle Annie, Willie We Have Missed You* and *Come Where My Love Lies Dreaming.* He preferred his sentimental songs to his plantation ditties, but it is for the latter that he will be most gratefully remembered.

FOSTO'RIA, Ohio, a city in Seneca and Hancock counties, near the boundary of Wood County, in the northwestern part of the state, thirty-five miles south of Toledo. It is on the Baltimore & Ohio, the Hocking Valley, the Lake Erie & Western and the New York, Chicago & Saint Louis railroads. The city has electric interurban service. In 1910 the population was 9,597; in 1916 it was 10,770, by Federal estimate. The area of the city exceeds two and one-half square miles.

Fostoria is in an agricultural country and near large oil fields. It has glass factories and lime kilns, and manufactures glass novelties, automobile and incandescent lamps, barrels, safes and machinery. The city has a Carnegie Library and a Y. M. C. A. building. It was founded in 1832 and became a city in 1854. Its growth and development were promoted by Charles Foster, later governor of Ohio and Secretary of the United States Treasury, and it was named in honor of his father, the first settler.

FOUCAULT, *foo ko'*, Jean Bernard Léon (1819-1868), a French physicist, born in Paris, whose name is associated with a pendulum experiment employed as a method of showing the rotation of the earth on its axis.

Two years after his appointment (1855) as physical assistant in the Paris observatory, he invented the polarizing prism which bears his name, and later he completed a reflector for the great telescope at Paris. He also is credited with the invention of the gyroscope and an apparatus for the better application of electric light, and he made many important discoveries in optics and photography. He was the first to discover that the sun may be viewed without injury to the eyesight if the object glass of a large telescope be covered with a thin film of silver. See GYROSCOPE.

FOUNDLING HOS'PITALS, institutions for children who are abandoned by their parents because of poverty, or because they do not wish to keep them. They are also homes for orphan children. In America, foundling hospitals are found in most of the larger cities, although in Massachusetts they have been abolished by law. Such institutions have to be protected by strict laws in regard to the admission of children, or they would be imposed upon by people guilty of illegal practices. In the main, the law is concerned with the abuse which may attend such hospitals, in connection with illegitimacy, and with the care given to helpless infants confided to them.

The death rate among the children at these places is seventy-five per cent, so the better institutions try to have the mother stay and nurse her child, unless they can persuade her not to abandon it. The New York Foundling Asylum has adopted the plan of placing as many children as possible in private homes for board. Those receiving such children must care for them according to the rules of the institution.

FOUND'RY, a place where metal castings are made. The Latin word *fondere* means *to pour,* and *founding* is literally a process of pouring molten steel, iron, brass or bronze into molds. The latter are usually of sand, and their design requires great skill. In hand molding a box called a *flask* is filled with sand, into which is then pressed a pattern of wood or metal the exact shape of the article to be manufactured, but slightly larger because the metal will contract in cooling. The sand is then packed tightly, and the pattern must taper toward the bottom or it will be impossible to withdraw it without spoiling the mold which has been formed. For patterns of irregular form molds are made in two or more parts. For a hollow casting a *core* of hardened sand is suspended within the mold. If any of the sand falls into the casting a *sand-hole* may result, perhaps rendering it useless.

The principles of machine molding are essentially the same as of hand molding, but the sand is packed and the patterns applied by machinery, with resulting increase in accuracy and speed for some varieties of work. For further information relating to cast iron and cast steel, see IRON.

FOUNTAIN, *foun'tin.* According to mythology, in the ages long ago the beautiful wood-nymph, Arethusa, who loved to go hunting, returned one day heated from the chase and went to bathe in the river. A voice from the

A NATURAL FOUNTAIN

Except for the opposing forces of atmospheric pressure and the attraction of gravitation, a fountain will rise as high as its source.

depths of the stream startled her, and she fled, but the voice followed, saying, "Why flyest thou, Arethusa? Alpheus am I, the god of this stream." Faster and faster she ran, but the god pursued her, so Diana changed her into a lovely fountain to save her. This ancient myth shows how the Greeks and Romans associated the gods with any unusual thing in nature, such as the natural fountain which shoots a stream of water from the ground and drops it into a basin formed around it. Just such a fountain is that of Vaucluse, in Southern France, where from 117,000 to 350,000 gallons of water shoot every minute into a circular pool surrounded by lofty cliffs. From there the water flows off through a ravine to form twenty brooks.

The operation of a fountain is based on the following principles: The flow of the fountain is caused by the pressure of the water in the pipe or crevice connecting the opening, through which the jet flows, with the reservoir. The higher the reservoir is above this opening, the higher will be the flow of the jet, on the principle that a jet of water will extend upward to the level of its source. This, however, will not hold true in practice because of friction, which keeps the jet a little lower than the source.

Many beautiful artificial fountains have been

made by forcing water up through pipes. The Tyler-Davidson fountain, which is considered one of the finest in the world as well as a masterpiece of art, is located in Fountain Square, Cincinnati, and was presented to the city by Henry Probasco, after being cast at the royal foundry, Munich, at a cost of $200,000. Another beautiful fountain is the *Spirit of the Great Lakes* by Lorado Taft (see illustration in article on CHICAGO), which is located at the south end of the Art Institute in Chicago. The five female figures represent the five Great Lakes of North America, and as each pours the water from her shell it falls into the basin below. Some of the famous fountains of recent date have been constructed for great expositions, such as the *Fountain of the Republic,* by Macmonnies, at the World's Columbian Exposition in Chicago in 1893; the fountain of *Man, Nature* and *Progress* at the Pan-American Exposition in Buffalo in 1901; the *Cascades* at the Louisiana Purchase Exposition at Saint Louis in 1904; and the *Fountain of the Earth* by Robert Aitken and the *Fountain of Energy* at the Panama-Pacific Exposition in 1915.

The fountains of the Greeks and Romans combined ornament and utility, for they supplied water for the poor who could not afford to have it brought to their homes. Many beautiful ones were constructed in Italy, France and Spain. The most famous in Europe are the Schöne Brunnen at Nuremberg, Germany; the Fontana Maggiore at Perugia, Italy; the Fontaine des Innocents at Paris, and the Alameda Fountain at Malaga, Spain.

FOUNTAIN OF YOUTH, a mythical spring supposed by certain old tribes of Indians in Central America and the West Indies to exist in a northern region called Bimini. Its waters were believed to restore youth and heal sickness. This legend was common to the peoples of many lands. The Indians made expeditions to Florida and the Bahamas in search of this spring; and early in the sixteenth century Ponce de Leon, Narvaez, De Soto and others led bands of explorers into the interior to seek it. A spring in Saint Augustine, Florida, which now has a paved courtyard and canopy, is said to be one of the many discovered by Ponce de Leon in his search for the elusive youth-restoring fountain.

FOUR-O'CLOCK, or **MARVEL OF PERU,** an old-fashioned South American plant, so called because its blossoms open late in the afternoon. Four-o'clocks send forth their fragrance to the night moths and insects, but close in the morning, never to open again, for each flower blooms but once. This plant thrives almost anywhere and is cultivated in gardens throughout America, especially as a bushy border plant or hedge, growing about two feet high. If the large dahlialike roots are saved and planted in the spring, stronger plants will grow than if seed is sown.

FOUR-O'CLOCK

Throughout the summer, until frosts appear, these plants send forth a succession of flowers, red, pink, yellow or white; sometimes there are several colors on one branch. The leaves are attached in pairs, are heart-shaped at the base, sharply-pointed at the tip, and the edges are smooth. The flowers are funnel-shaped, spreading into five-notched lobes whose edges overlap. Above the flower opening appear five slender stamens, and above these stretches a slender thread ending in a white knob. When the flower has withered it will be seen that at the end of this thread a seed-pod has grown, in which rests one large seed.

The bare-headed, dull-plumaged *friar bird* of Australia is called four-o'clock, in imitation of its cry.

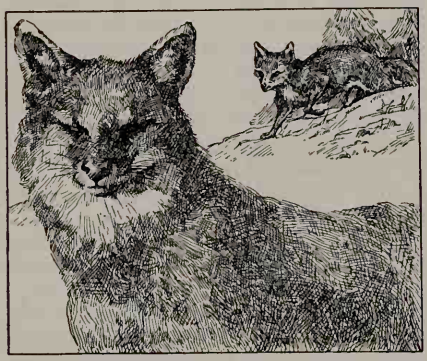
FOURTH OF JULY. See INDEPENDENCE DAY.

FOWL, *foul,* a word derived from the Anglo-Saxon *fugol,* and the German *vogel,* meaning a *bird.* It is now applied generally to certain land and water birds known respectively as wild-fowl and waterfowl, but more particularly to the common domestic chicken. There are many varieties of domestic fowls, but all are more or less directly descended from the wild pheasant (which see). Careful breeding and selection have modified the form and coloring, but many of the original characteristics remain. The feet and beak of the fowl are similar to those of the pheasant, but it grows a naked fleshy substance called a *comb* instead of the feathers ornamenting the top of the pheasant's head.

The fowl has been domesticated for over 2,000 years, and has gradually spread from the East Indies, China and the Malay Archipelago, of which countries it is a native, to every part of the world. Most common of the varieties is poultry, closely followed in economic value by ducks and geese (see POULTRY;

Duck; also the leading wild game birds, all described under their titles). The male chicken, except in cases of pure white or pure black varieties, is always more brightly-colored than the female. In addition to this, the male is further ornamented by two long feathers in the tail, which fall in a graceful arch and greatly improve his appearance. The cock is a vainglorious boaster; tradition hands down the story that he is filled with pride because he believes his crow causes the sun to rise. The hen is more modest and retiring, only showing pride when she has laid an egg or hatched a brood of chickens.

FOX, one of the most cunning of the beasts of prey, an animal related to dogs, wolves and jackals. Species of fox are found wild in all countries of the northern hemisphere, and breeding of foxes in captivity, for future use



Treason is but trusted like the fox
Who, ne'er so tame, so cherished or locked up,
Will have a wild trick of his ancestors.
—Shakespeare: *Henry IV.*

of their fur, is a rapidly growing, paying industry. Silver-black fox fur, with its rich brilliance and sheen, has been considered the choicest and most valuable since the use of furs began. Realizing the gradual decrease in numbers of the silver-black fox and the constant demand for its fur, a man in Prince Edward Island began breeding them about the year 1890. The industry quickly developed, and it has been growing and spreading to all parts of the world. As yet the animals are not freely killed for their furs, for the live animals, sold in pairs for breeding purposes, are so much in demand that some are worth as much as $35,000, the prices per pair ranging from $4,000 upward. One pelt, however, easily brings $1,000 while the supply is yet limited. Pelts of the *blue* or *Arctic fox* are also very valuable, and fur-farming is an important industry on the Aleutian Islands. Ordinary pelts of the plentiful *red fox* bring from $5 to $8 each. Beautiful silver-gray pelts of the *gray fox* sell for as much as $50 each.

Foxes differ in size from their relatives, the wolves and jackals, being generally smaller and having larger, more furry and triangular ears, more pointed muzzles and straighter jaws, longer and more bushy tails and longer hair. All foxes live in holes in the earth, or in holes in rocks or trees; but unlike most burrowing animals, they do not sleep throughout the winter. They prowl about at night, stealthily approaching their prey of woodchucks, rabbits, ground birds, poultry, etc., or sometimes lambs, which they capture with a quick rush. When other food is scarce, however, they will consume rats, mice, frogs, worms, beetles or even fruits. Foxes breed in early spring from the first year and sometimes for ten years thereafter, producing annually from three to seven young. The life of the fox is from fourteen to sixteen years. The eyes of the young do not open until from nineteen days to a month after birth, and after that time, for about two months, both parents watch them and protect them carefully, and the mother fox nurses them for six months. A yelping bark is the call and cry of the fox. The scent which hounds of the huntsmen follow is secreted by a gland beneath the tail. When a fox is captured it will sometimes pretend it is dead, and will endure the roughest treatment without a sign of life.

In addition to the species already mentioned, all of which are natives of America, there are the yellowish-gray *kit, swift,* or *burrowing fox* of the dry plains of Western America; the small, pretty *India fox;* the pale *desert fox* of Arabia and Afghanistan; and the *red fox* or *Reynard,* of Europe, immortalized in numerous tales and fables, and through England's greatest of sports, the interesting and exciting fox hunt. M.S.

Consult Seton's *Biography of a Silver Fox;* Tregarthen's *The Life Story of a Fox.*

FOX, a tribe of Indians of Algonquian stock, called in their own language *Meshkwakihug,* or *Red-Earth People.* Their familiar name, Fox, was given them by the French. When first known to the white man they were living in Central Wisconsin, having been driven there from the Lake Superior region by the attacks of the Ojibwa. In order to protect themselves from this tribe and from the French, they

united with the Sac Indians about 1760, and the two tribes have since then been practically one. They are scattered over Oklahoma, Iowa, Kansas and Nebraska, and number about 700. The Fox were a woodland people, living in bark houses and raising corn and vegetables. See SAC.

FOX, CHARLES JAMES (1749-1806), a brilliant English statesman and orator, a friend of the American colonies in their fight for freedom. He was born at Westminster, educated at Eton and Oxford, and in 1768 entered Parliament as a Tory. He was junior lord of the admiralty and treasury, 1770-1774, during Lord North's ministry. Later he joined the Whig party, and in 1762 was foreign secretary under Lord Rockwell. He supported the cause of the American colonies in Parliament during the American Revolution, and because of this his political career was disturbed by the enmity of King George III and by the bitter opposition of Pitt. *The History of the Reign of James II,* although incomplete, is the most important of his writings, but is considered of little historic or literary value.

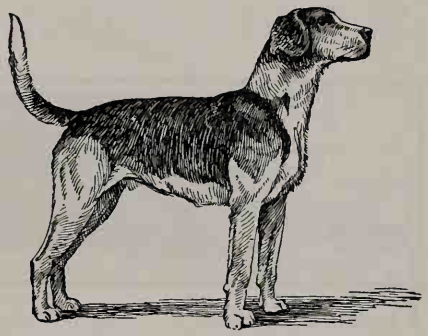
FOX, GEORGE (1624-1691), born at Fenny-Drayton, Leicestershire, England, was the founder of the Society of Friends, or Quakers, the organization of which was completed about 1669. At the age of twenty-one he believed himself to be the subject of divine call, and wandered from place to place spreading his views respecting religious reforms. He made missionary journeys through Ireland, Scotland, the West Indies, North America and Holland, and had many followers. He was frequently imprisoned for his public denial of the Scriptures as the source of divine truth, and in 1655 was examined on such charges and acquitted by Cromwell. His followers were first called *Quakers* because he had exhorted the magistrates "to tremble at the word of the Lord." See QUAKERS.

FOX, JOHN [WILLIAM] Jr. (1863-), author of a large number of novels dealing with the mountaineers of the Southern United States, was born in Kentucky and was graduated from Harvard University in 1883. Principal among his works is *The Trail of the Lonesome Pine,* which was dramatized and successfully produced for a number of years. Other romances include *The Little Shepherd of Kingdom Come, The Heart of the Hills, A Mountain Europa* and *Following the Sun Flag,* the latter being an account of his experiences in the Russo-Japanese War. In 1908 Mr. Fox married Fritzi Scheff, an actress, who divorced him several years later.

FOXGLOVE, a flowering plant, beautiful along walks and in shrubberies. It is a native of Europe, but is now common in America, thriving in light, rich soil, which must be partially shaded. The leaves are long, oval, rough and downy. The flowers are drooping tubes of lilac, rose, yellow or white, closely clustered on a spike, and all turning to one side. *Digitalis* is its Latin name, meaning *finger;* the thimble shape of the flowers no doubt suggested the name.

From the leaves and stems of the stately foxglove is prepared the drug *digitalis,* a bitter substance which is used to stimulate heart action; in large doses, however, it may prove fatal. See MEDICINE AND DRUGS.

FOXHOUND, a strong, speedy hound, remarkable for its keen scent and endurance. It is descended from the bloodhound, the principal characteristics of that animal being considerably changed by careful selection and



FOXHOUND

breeding. To the strength of the bloodhound has been added some of the fleetness of the staghound. The foxhound is largely white, with patches of black or tan; it has short coarse hair, large ears and straight, sturdy legs. The usual height is from twenty to twenty-two inches. This dog is very intelligent and is easily trained, and is reliable in following the scent of foxes. The well-bred, highly trained foxhounds in English hunting packs are the result of generations of attention and care.

FOXTAIL GRASS, a valuable fodder grass found in all temperate countries, which bears flower clusters in shape remotely like a fox's tail. The *meadow* foxtail grass, with its silvery hairs, is very hardy and one of the best pasture

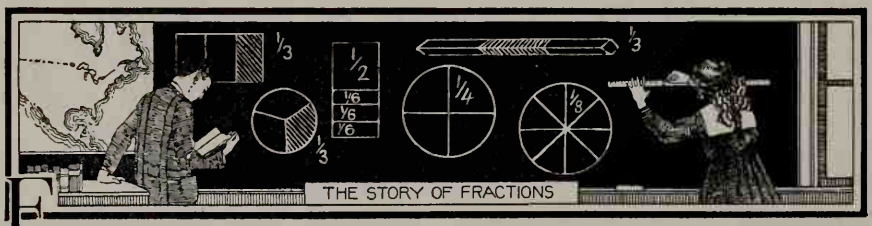
grasses introduced into America from Europe. The *mountain* species, found in the rich soil along streams in the Rocky Mountains, yields a large amount of excellent hay and is proving valuable for cultivation in the New England and north Middle States. A few other species are dry and harsh and sometimes troublesome as weeds.

FOXTAIL GRASS

Foxtail millets, which are closely related to the grasses, found in all the warmer and temperate regions, are very valuable for forage, and some species as food for man. See Millet.

FOX TER'RIER, a small, lively, short-haired dog, probably the most popular of all terriers. It is a very quick, intelligent and tireless animal, and is of the species most frequently seen in dog performances. It was formerly employed to drive foxes from their holes for hunters, and this accounts for its name; but it is now chiefly kept as a pet. In color it is usually white, with black and tan markings on the head. In a thoroughbred the head should be flat and rather narrow, with strong jaws, small eyes, small V-shaped ears carried close to the head, and nose black and tapering. The legs should be straight and strong. Carried gaily is a high-set tail, which is usually docked. Some fox terriers have smooth coats, but others have hair hard and wiry. The average weight of one of these animals is twenty pounds, and its length of life is about fifteen years. It is a very affectionate animal.

SMOOTH FOX TERRIER



FRACTIONS, Common. A fraction is one or more of the equal parts into which a unit is divided. There are two general classes of fractions, *common* and *decimal* fractions. The former are written with one number above a dividing line and one number below. (For the discussion of decimal fractions see the article Decimal Fractions.) Let Fig. 1 (below) represent a piece of cardboard 16 inches long and 5 inches wide. Each of the divisions marked ¼ represents one of the four equal parts of the entire piece. The portions designated as ½ are each equal to two of these parts; that is, each is one-half of the entire piece.

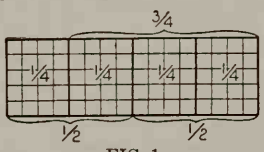


FIG. 1

Five boys in a manual training shop have a rectangular piece of leather which is to be divided equally among them for their work (see Fig. 2). Each boy takes one-fifth of the piece. He knows that this portion is his share because he sees that each boy can take a piece the same size as his. The boys must have some measure by which they can divide the piece into five equal parts. They probably use a measure which they all recognize as a standard, such as the inch. Having decided on this standard, they may measure the length of the piece and find it 20 inches, while the width is the same throughout. In the drawing are shown the divisions.

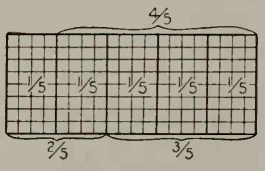


FIG. 2

FIG. 3

Two boys use two-fifths; three boys use three-fifths; four boys use four-fifths of the piece. All the boys use five-fifths of the piece, or all of it. If only three boys take their parts there will be left two-fifths of the piece. If four boys take their parts only one-fifth of the piece is left.

John and Eric have a dollar which they are to divide equally between them. They may use as their measure one dime, one quarter, one penny or one-half dollar.

(1) If they change the dollar for dimes, they have 10 dimes, and each one takes 5 dimes, or five-tenths of the dollar (see Fig. 3).

(2) If they change the dollar for quarters, each one takes two quarters and has two-fourths of the dollar (see Fig. 4).

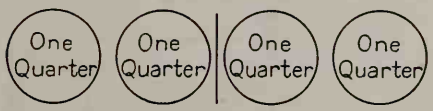


FIG. 4

(3) If they change their dollar for pennies, each one takes 50 pennies, and has fifty-hundredths of the dollar. But in each case, each boy has one-half of the dollar because there are two boys who receive equal parts of the dollar.

So we see here that five-tenths, two-fourths, fifty-hundredths and one-half of a dollar are all of the same value.

The fractions named above are written thus: $\frac{5}{10}$, $\frac{2}{4}$, $\frac{50}{100}$, $\frac{1}{2}$. We see that $\$\frac{5}{10}=\$\frac{1}{2}$; that $\$\frac{2}{4}=\$\frac{1}{2}$; that $\$\frac{50}{100}=\$\frac{1}{2}$; that $\$\frac{50}{100}=\$\frac{5}{10}$; that $\$\frac{50}{100}=\$\frac{2}{4}$.

Common fractions are written as above; the number below the line tells the number of parts into which the whole is divided, and the number above the line tells how many of these parts we are considering, or are working with. The number below, which is called the *denominator,* shows the unit of measure, while the number above the line, called the *numerator,* shows how many such units of measure we are considering. For example, $\frac{3}{4}$ foot means that $\frac{1}{4}$ foot is used as a unit of measure, and the whole length measured contains *three* of the measuring units. Fig. 5 shows the measuring unit, the whole length undivided, and the whole length measured.

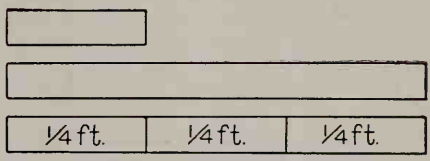


FIG. 5

The denominator and numerator together are called the *terms* of a fraction.

Reduction of Fractions to Higher and Lower Terms. The process of reducing fractions to higher or lower terms, without changing the value, enters into numerous practical problems.

(1) From Fig. 6 (upper diagram) we see that $\frac{1}{8}=\frac{1}{2}$; $\frac{2}{8}=\frac{1}{4}$; $\frac{6}{8}=\frac{3}{4}$.

(2) From Fig. 6 (middle diagram) we see that $\frac{2}{6}=\frac{1}{3}$; $\frac{3}{6}=\frac{1}{2}$; $\frac{4}{6}=\frac{2}{3}$.

(3) From Fig. 6 (lower diagram) we see that $\frac{1}{8}=\frac{3}{24}$; $\frac{2}{8}=\frac{6}{24}$; $\frac{1}{4}=\frac{6}{24}$; $\frac{1}{2}=\frac{12}{24}$; $\frac{15}{24}=\frac{5}{8}$; $\frac{16}{24}=\frac{2}{3}$; $\frac{9}{24}=\frac{3}{8}$; $\frac{21}{24}=\frac{7}{8}$.

(4) In general, we see that two fractions of different form may have the same value.

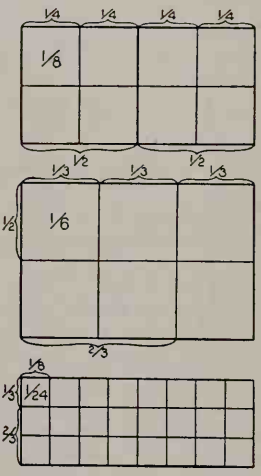


FIG. 6

(a) Divide a yard into three equal parts; one part is $\frac{1}{3}$ of a yard, or 12 inches.

(b) Divide a yard into six equal parts; one part is $\frac{1}{6}$ of a yard.

$\frac{1}{6}$ yard is only $\frac{1}{2}$ as long as the $\frac{1}{3}$ yard obtained (a) by dividing the yard into three equal parts; to obtain a part 12 inches in length, we must use as a measure two $\frac{1}{6}$ yard, or $\frac{2}{6}$ yard. It follows then that $\frac{2}{6}$ yard equals $\frac{1}{3}$ yard.

As the denominator grows larger, the unit

part grows smaller, and the number of parts considered or used (shown by the numerator) must grow greater when we desire to keep the value of the fraction fixed. Thus $\frac{2}{3}$ yard shows that $\frac{1}{3}$ yard is the unit of measure in use, and that two such units are under consideration in the form $\frac{2}{3}$ yard. Let the unit of measure be changed to $\frac{1}{6}$ yard, and four such units must be used to keep the value $\frac{2}{3}$ yard. Let the unit of measure be changed again to $\frac{1}{12}$ yard, and eight such units must be used to keep the value $\frac{2}{3}$ yard. $\frac{2}{3}$ yd.$=\frac{4}{6}$ yd.$=\frac{8}{12}$ yd.

These facts may be summarized thus: *Multiply both terms of a fraction by the same number and the value of the fraction remains the same,* as, $\frac{2\times 2}{3\times 2}=\frac{4}{6}$.

Divide both terms of a fraction by the same number and the value of the fraction remains the same, as, $\frac{8\div 4}{12\div 4}=\frac{2}{3}$.

Divide both terms of a fraction by the same number; repeat this with the resulting fraction until the terms have no common factor; then the fraction is in its lowest terms; or, *divide both terms of the fraction by their greatest common factor; then the fraction is in its lowest terms;* for example,

$\frac{24\div 4}{96\div 4}=\frac{6}{24}$; $\frac{6\div 6}{24\div 6}=\frac{1}{4}$; or $\frac{24\div 24}{96\div 24}=\frac{1}{4}$.

(See Fig. 7.)

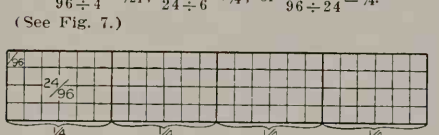


FIG. 7

Problems. Reduce the following fractions to lowest terms: $\frac{12}{15}$, $\frac{16}{20}$, $\frac{36}{48}$, $\frac{7}{21}$, $\frac{18}{27}$, $\frac{16}{24}$, $\frac{45}{60}$, $\frac{8}{36}$, $\frac{22}{99}$, $\frac{14}{35}$, $\frac{42}{105}$, $\frac{100}{150}$, $\frac{150}{300}$, $\frac{756}{1890}$, $\frac{261}{657}$, $\frac{378}{8181}$, $\frac{311}{4554}$. To find the common divisors of numerator and denominator, in difficult cases, refer to DIVISIBILITY OF NUMBERS; then study article in this connection.

Reduce the following fractions to higher terms: $\frac{1}{2}$, $\frac{5}{8}$, $\frac{2}{5}$, $\frac{5}{6}$, $\frac{7}{8}$.

Reduce the following fractions to 36ths: $\frac{1}{9}$, $\frac{1}{4}$, $\frac{2}{9}$, $\frac{3}{4}$, $\frac{5}{18}$, $\frac{5}{6}$.

Reduce the following fractions to 42nds: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{14}$, $\frac{3}{7}$, $\frac{5}{6}$, $\frac{2}{3}$, $\frac{9}{14}$, $\frac{6}{7}$, $\frac{3}{21}$.

Addition. (1) James has a pound of candy; he gives Alice $\frac{1}{4}$ of it; his mother $\frac{1}{4}$ of it, and eats $\frac{1}{4}$ of it himself. (a) What part of a lb. has he given away? (b) What part of a lb. is gone?

(a) $\frac{1}{4}$ lb.$+\frac{1}{4}$ lb.$=\frac{2}{4}$ lb.$=\frac{1}{2}$ lb.

(b) $\frac{1}{4}$ lb.$+\frac{1}{4}$ lb.$+\frac{1}{4}$ lb.$=\frac{3}{4}$ lb.; or,
$\frac{2}{4}$ lb.$+\frac{1}{4}$ lb.$=\frac{3}{4}$ lb.

(2) Add \$$\frac{1}{5}$ and \$$\frac{3}{5}$.

\$$\frac{1}{5}$+\$$\frac{3}{5}$=\$$\frac{4}{5}$.

(3) A child gains $\frac{3}{4}$ lb. in weight one week and $\frac{3}{4}$ lb. the next week. What has he gained in all?

$\frac{3}{4}$ lb.$+\frac{3}{4}$ lb.$=\frac{6}{4}$ lb.$=\frac{3}{2}$ lb.

(4) On your ruler find the sum of $\frac{3}{8}$ in., $\frac{5}{8}$ in. and $\frac{7}{8}$ in.

$\frac{3}{8}$ in.$+\frac{5}{8}$ in.$+\frac{7}{8}$ in.$=\frac{15}{8}$ in.

(5) Add the following fractions; do not reduce the answers:

(a) $\frac{2}{9}+\frac{3}{9}+\frac{7}{9}+\frac{1}{9}+\frac{8}{9}=\frac{21}{9}$.
(b) $\frac{1}{8}+\frac{5}{8}+\frac{9}{8}+\frac{11}{8}+\frac{3}{8}=\frac{28}{8}$.
(c) $\frac{7}{24}+\frac{9}{24}+\frac{1}{24}+\frac{13}{24}+\frac{23}{24}=\frac{53}{24}$.

(6) Add the following fractions; reduce the answers:

(a) $\frac{3}{7}+\frac{1}{7}+\frac{9}{7}+\frac{6}{7}+\frac{2}{7}=\frac{21}{7}=3$.
(b) $\frac{5}{6}+\frac{2}{6}+\frac{7}{6}=\frac{14}{6}=\frac{7}{3}=2\frac{1}{3}$.
(c) $\frac{7}{10}+\frac{9}{10}+\frac{14}{10}=\frac{30}{10}=3$.

A whole number, as 3, is a more convenient form to think of, and to realize the value of, than such a fraction as $\frac{30}{10}$, and it is customary to change such fractions (those whose value is one or more than one) to whole or mixed numbers; as, $\frac{3}{2}=1\frac{1}{2}$, $\frac{9}{3}=3$, $\frac{28}{8}=3\frac{4}{8}$.

(7) Henry, Mary and Alice put their money together to buy a record for a victrola. Henry gave $\frac{1}{2}$ of the money and Mary $\frac{1}{4}$ of it. (a) What part did they together give?

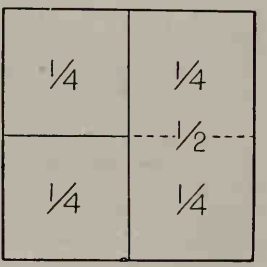


FIG. 8

$\frac{1}{2}$ of money$+\frac{1}{4}$ of money$=\frac{3}{4}$ of money.

(b) What part did Alice give?

Alice gave $\frac{1}{4}-\frac{3}{4}$ or $\frac{1}{4}$.

$\frac{1}{2}+\frac{1}{4}+\frac{1}{4}=\frac{1}{4}$. (See Fig. 8.)

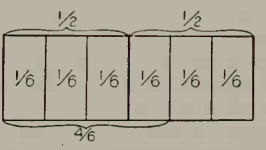


FIG. 9

(8) Add $\frac{1}{2}$ and $\frac{1}{6}$.

$\frac{1}{2}+\frac{1}{6}=\frac{3}{6}+\frac{1}{6}=\frac{4}{6}$. (See Fig. 9.)

(9) Add \$$\frac{1}{5}$ and \$$\frac{1}{10}$.

2 dimes$+1$ dime$=$\$$\frac{2}{10}$+\$$\frac{1}{10}$=\$$\frac{3}{10}$.

(10) Add $\frac{3}{8}$ and $\frac{3}{4}$.

$\frac{3}{8}+\frac{3}{4}=\frac{3}{8}+\frac{6}{8}=\frac{9}{8}$.

Unit of Measure. $\$\frac{3}{5}$ is 3 (one-fifth of a dollar); read, 3 times one-fifth of a dollar;

$\frac{7}{12}$ ft. is 7 (one-twelfth of a foot);

$\frac{2}{3}$ yd. is 2 (one-third of a yard);

$\frac{3}{4}$ bu. is 3 (one-fourth of a bushel);

$\frac{7}{8}$ lb. is 7 (one-eighth of a pound).

In the above, $\$\frac{1}{5}$, $\frac{1}{12}$ ft., $\frac{1}{3}$ yd., $\frac{1}{4}$ bu. and $\frac{1}{8}$ lb. are each the unit of measure, while 3, 7, 2, 3, and 7, the numerators, designate how many units of measure there are in the fraction under consideration. The unit of measure is called also the *fractional unit.*

Note the unit of measure, or fractional unit, in the following fractions:

Fractions	Unit of measure
$\frac{4}{5}$ lb.	$\frac{1}{5}$ lb.
$\frac{7}{8}$ yd.	$\frac{1}{8}$ yd.
$\frac{1}{9}$ lb.	$\frac{1}{9}$ lb.
$\$\frac{1}{5}$	$\$\frac{1}{5}$
$11\frac{1}{12}$ T.	$\frac{1}{12}$ T.
$\frac{7}{9}$ mi.	$\frac{1}{9}$ mi.
$\frac{3}{4}$ A.	$\frac{1}{4}$ A.

Fractions that have the same unit of measure are added very readily, as, $\frac{3}{4}$ in.$+\frac{2}{4}$ in.$=\frac{5}{4}$ in.; $\frac{1}{5}$ mi.$+\frac{3}{5}$ mi.$=\frac{4}{5}$ mi. Fractions which have not the same unit of measure must be changed, and expressed in terms of a common unit before they can be added, as, $\$\frac{3}{4}+\$\frac{7}{8}=\$\frac{6}{8}+\$\frac{7}{8}=\$1\frac{3}{8}$.

This is sometimes stated as follows: Fractions of different denominations must be reduced to the same denomination, or to a common denominator, before they can be added. In many cases we can see readily what this new denominator must be, as in adding $\frac{1}{4}$ and $\frac{1}{2}$, $\frac{1}{8}$ and $\frac{1}{2}$ and $\frac{1}{4}$, $\frac{1}{3}$ and $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{4}$ and so on. Often we cannot see readily what this new denominator must be, but from what we have done above, in reducing fractions, we see that it must be a number which is divisible by each of the denominators of the fractions to be added. It is called a *multiple* of the denominators. (For further discussion of multiple, refer to Least Common Multiple and study carefully in connection with this subject.)

In adding fractions we may use any common denominator, but it is desirable to use the smallest number that will serve the purpose; this is called the *least common denominator;* for example,

(a) $\frac{5}{24}+\frac{7}{8}+\frac{2}{3}=\frac{120}{576}+\frac{504}{576}+\frac{384}{576}=\frac{1008}{576}$

(b) $\frac{5}{24}+\frac{7}{8}+\frac{2}{3}=\frac{15}{72}+\frac{63}{72}+\frac{48}{72}=\frac{126}{72}$

(c) $\frac{5}{24}+\frac{7}{8}+\frac{2}{3}=\frac{5}{24}+\frac{21}{24}+\frac{16}{24}=\frac{42}{24}=\frac{7}{4}$

$\frac{1008}{576}=\frac{42}{24}=\frac{7}{4}$

$\frac{126}{72}=\frac{42}{24}=\frac{7}{4}$

In (a) and (b) the common denominators are larger than in (c), where the least common denominator is used. We see that (c) is the simplest solution.

Add $\frac{1}{8}$, $\frac{3}{5}$, $\frac{5}{6}$. The least common denominator is 120.

$1=\frac{120}{120}$

$\frac{1}{8}=\frac{1}{8}$ of $\frac{120}{120}=\frac{15}{120}$

$\frac{1}{5}=\frac{1}{5}$ of $\frac{120}{120}=\frac{24}{120}$

$\frac{3}{5}=3\times\frac{24}{120}=\frac{72}{120}$

$\frac{1}{6}=\frac{1}{6}$ of $\frac{120}{120}=\frac{20}{120}$

$\frac{5}{6}=5\times\frac{20}{120}=\frac{100}{120}$

$\frac{1}{8}+\frac{3}{5}+\frac{5}{6}=\frac{15}{120}+\frac{72}{120}+\frac{100}{120}=\frac{187}{120}$

We may also look at the reduction in this way: By what number must both terms of $\frac{1}{8}$ be multiplied so that it will be expressed in 120ths? By what number must both terms of $\frac{3}{5}$ be multiplied, and so on, as seen below:

$\frac{1}{8}=\frac{n}{120}$ $\qquad \frac{1\times 15}{8\times 15}=\frac{15}{120}$

$\frac{3}{5}=\frac{n}{120}$ $\qquad \frac{3\times 24}{5\times 24}=\frac{72}{120}$

$\frac{5}{6}=\frac{n}{120}$ $\qquad \frac{5\times 20}{6\times 20}=\frac{100}{120}$

8 must be multiplied by 15 to produce 120, and so *both terms* of the fraction must be multiplied by 15 to reduce it to 120ths. The same analysis holds for $\frac{3}{5}$ and $\frac{5}{6}$.

Add $\frac{20}{63}$, $\frac{7}{72}$, $\frac{5}{36}$.

(a) Find the least common denominator, which is the least common multiple of 63, 72 and 36, or 504.

(b) $\frac{20\times 8}{63\times 8}=\frac{160}{504}$

$\frac{7\times 7}{72\times 7}=\frac{49}{504}$

$\frac{5\times 14}{36\times 14}=\frac{70}{504}$

$\frac{279}{504}=\frac{31}{56}$

Mixed Numbers. Dan has \$6 in his bank, and \$.75 in his pocket. He has altogether \$6.75 or $\$6\frac{3}{4}$. John measured his father. He found him to be 5 feet and 9 inches tall. He is $5\frac{3}{4}$ feet tall. $\$6\frac{3}{4}$ and $5\frac{3}{4}$ feet, and all such numbers made up of a whole number and a fraction, are called *mixed numbers* (see Fig. 10).

Addition of Mixed Numbers. Sarah has $4\frac{7}{8}$ yd. of ribbon in one piece and $6\frac{1}{2}$ yd. in another. How much has she in all?

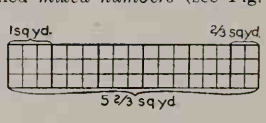


FIG. 10

$4\frac{7}{8}$ yd.$+6\frac{1}{2}$ yd.$=4\frac{7}{8}$ yd.$+6\frac{4}{8}$ yd.$=10\frac{11}{8}$ yd.

Add $7\frac{2}{5}$, $9\frac{1}{3}$, $16\frac{3}{4}$.

$7\frac{2}{5}=7\frac{24}{60}$

$9\frac{1}{3}=9\frac{20}{60}$

$16\frac{3}{4}=16\frac{45}{60}$

$32\frac{89}{60}=33\frac{29}{60}$

To add mixed numbers, find the sum of the whole numbers; find the sum of the fractions, and combine the results. Answers in addition of fractions and of mixed numbers should be reduced to their simplest forms.

Subtraction of Fractions. (1) Jane has ⅞ of a yard of flowered ribbon. She cut off ⅜ of a yard for her doll's skirt; ⅜ of a yard for her jacket, and made a pretty hand-bag out of what was left. (a) How much did she have left after the skirt was cut off? (b) How much did she have for the hand-bag?

(a) ⅞ yd. − ⅜ yd. = ⅛ yd. = ½ yd.
(b) ⅛ yd. − ⅜ yd. = ⅜ yd. = ¼ yd.
(See Fig. 11.)

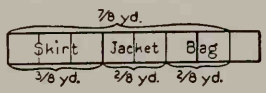


FIG. 11

(2) Subtract (a) ¼ from ¾; (b) ⅛ from ⅝; (c) 1/6 from ⅚; (d) ⅖ from ⅘; (e) ⅔ from ⅞.

(a) ¾ − ¼ = ¾
(b) ⅝ − ⅛ = ½
(c) ⅚ − 1/6 = 1/6
(d) ⅘ − ⅖ = ⅖
(e) ⅞ − ⅔ = 5/9

(3) Mr. Stevens owned 37/64 of a section of land; he sold to Mr. Miles 19/64 of a section. (a) What part of a section had he left? (b) How much more land had Mr. Miles, then, than Mr. Stevens?

(a) 37/64 section − 19/64 section = 18/64 section
(b) 19/64 section − 18/64 section = 1/64 section. (See Fig. 12.)

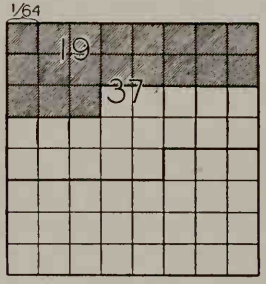


FIG. 12

(4) A train ran ⅔ of a mile the first minute, ⅚ of a mile the second. What was the increase of speed the second minute?

⅚ mi. − ⅔ mi. = ⅚ mi. − 4/6 mi. = 1/6 mi.

(5) How much heavier is ⅞ of a rectangular cake of candy than ⅔ of it, the whole weighing one pound?

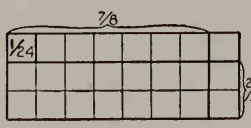


FIG. 13

⅞ lb. − ⅔ lb. = 2 1/24 lb. − 16/24 lb. = 5/24 lb. (See Fig. 13.)

(6) 7/9 − ⅔ = *n*.
7/9 − ⅔ = 7/9 − 6/9 = 1/9

(7) 13/15 − ⅔ = *n*.
13/15 − ⅔ = 13/15 − 10/15 = 3/15

(8) 1/6 − 1/8 = *n*.
1/6 − 1/8 = 4/24 − 3/24 = 1/24. (See Fig. 14.)

(9) A woman buys ⅞ of a pound of round steak. The bone weighs 3/16 of a pound. How much meat has she?

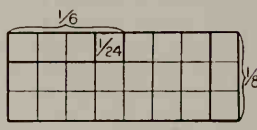


FIG. 14

⅞ lb. − 3/16 lb. = 14/16 lb. − 3/16 lb. = 11/16 lb.

(10) 7/16 − ⅜ = *n*
7/16 − 6/16 = 1/16.

(11) ⅝ − 1/16 = *n*
10/16 − 1/16 = 9/16.

(12) 9/16 − ¼ = *n*
9/16 − 4/16 = 5/16.

(1) *When fractions have the same unit of measure subtract the numerator of the subtrahend from that of the minuend, as in the first set of problems given above.*

(2) *When fractions have not the same unit of measure express them in terms of the same unit or in terms of their least common denominator and subtract as in 1.*

Addition and Subtraction of Unit Fractions. A fraction whose numerator is 1 is called a *unit fraction*, as, ½, 1/3.

$$\frac{1}{2}+\frac{1}{3}=\frac{3}{6}+\frac{2}{6}=\frac{3+2}{6}=\frac{5}{6}$$

$$\frac{1}{5}+\frac{1}{2}=\frac{2}{10}+\frac{5}{10}=\frac{2+5}{10}=\frac{7}{10}$$

$$\frac{1}{3}+\frac{1}{4}=\frac{4+3}{4\times 3}=\frac{7}{12}$$

$$\frac{1}{5}+\frac{1}{3}=\frac{3+5}{5\times 3}=\frac{8}{15}$$

$$\frac{1}{6}+\frac{1}{7}=\frac{7+6}{7\times 6}=\frac{13}{42}$$

$$1/a+1/n=\frac{n+a}{n\times a}$$

The sum of two unit fractions is the sum of the denominators over the product of the denominators.

$$\frac{1}{2}-\frac{1}{3}=\frac{3-2}{3\times 2}=\frac{1}{6}$$

$$\frac{1}{2}-\frac{1}{5}=\frac{5-2}{2\times 5}=\frac{3}{10}$$

$$\frac{1}{3}-\frac{1}{4}=\frac{4-3}{4\times 3}=\frac{1}{12}$$

$$\frac{1}{6}-\frac{1}{7}=\frac{7-6}{7\times 6}=\frac{1}{42}$$

$$1/a-1/b=\frac{b-a}{a\times b}$$

The difference between two unit fractions is the difference between the denominators over the product of the denominators.

Subtraction of Mixed Numbers. (1) From a bucket of candy weighing $19\frac{13}{16}$ lbs., a box weighing $7\frac{2}{16}$ lbs. was filled; how much candy was left in the bucket?

$19\frac{13}{16}$ lb. $-$ $7\frac{2}{16}$ lb. $=$ $12\frac{11}{16}$ lb.

(2) From $5\frac{9}{16}$ subtract $3\frac{4}{16}$.

$5\frac{9}{16}-3\frac{4}{16}=2\frac{5}{16}$

(3) From $12\frac{4}{5}$ subtract $9\frac{1}{5}$.

$12\frac{4}{5}-9\frac{1}{5}=3\frac{3}{5}$

(4) From $9\frac{6}{7}$ subtract $4\frac{3}{7}$.

$9\frac{6}{7}-4\frac{3}{7}=5\frac{3}{7}$

When the fraction in the subtrahend is larger than that in the minuend, there is another step in the process, as shown below.

(1) $28\frac{1}{3}-12\frac{3}{5}=n$

$$\begin{aligned} 28\tfrac{1}{3} &= 28\tfrac{5}{15} = 27 + (\tfrac{15}{15}+\tfrac{5}{15}) = 27\tfrac{20}{15} \\ 12\tfrac{3}{5} &= 12\tfrac{9}{15} = \qquad\qquad\quad 12\tfrac{9}{15} \\ & \qquad\qquad\qquad\qquad\quad\ \overline{15\tfrac{11}{15}} \end{aligned}$$

We cannot take $\frac{9}{15}$ out of $\frac{5}{15}$, so we take 1 out of 28 and reduce it to $\frac{15}{15}$ and combine this with the $\frac{5}{15}$; then we have $27\frac{20}{15}$. From this we subtract $12\frac{9}{15}$.

(2) From a fruit cake weighing $3\frac{2}{3}$ pounds, a baker cut $1\frac{3}{4}$ pounds. How much had he left?

$$\begin{aligned} & 3\tfrac{2}{3}\text{ lb.} - 1\tfrac{3}{4}\text{ lb.} = 1\tfrac{11}{12}\text{ lb.} \\ 3\tfrac{2}{3} &= 3\tfrac{8}{12} = 2 + (\tfrac{12}{12}+\tfrac{8}{12}) = 2\tfrac{20}{12} \\ 1\tfrac{3}{4} &= 1\tfrac{9}{12} = \qquad\qquad\quad 1\tfrac{9}{12} \\ & \qquad\qquad\qquad\qquad\quad\ \overline{1\tfrac{11}{12}} \end{aligned}$$

There is another method which is of sufficient interest to give it a place here, although it is not used generally. For example:

$$\begin{array}{r} 3\quad \tfrac{2}{3} \\ -1\quad \tfrac{3}{4} \\ \hline 1+\tfrac{1}{4}+\tfrac{2}{3}=1\tfrac{11}{12} \end{array}$$

Take 1 out of 3, leaving 2. Subtract the whole numbers and have 1; subtract $\frac{3}{4}$ from the 1 we took from 3 and have $\frac{1}{4}$. We still have $\frac{2}{3}$ in the minuend, and the answer is $1+\frac{1}{4}+\frac{2}{3}=1\frac{11}{12}$.

Use this method with the following:

$$\begin{array}{l} 6\tfrac{1}{5} \\ 4\tfrac{2}{3} \\ \hline 1\tfrac{1}{3}+\tfrac{1}{5}=1\tfrac{8}{15} \end{array} \qquad \begin{array}{l} 19\tfrac{2}{3} \\ 15\tfrac{4}{5} \\ \hline 3\tfrac{1}{5}+\tfrac{2}{3}=3\tfrac{13}{15} \end{array}$$

Problems. 1. What is the distance around a room $14\frac{2}{3}$ feet long and $12\frac{3}{4}$ feet wide? How much longer is it than it is wide?

2. The ice froze $\frac{2}{3}$ inch one night, $\frac{3}{4}$ inch the next night, and $\frac{5}{8}$ inch the next night. How thick was the ice?

3. A farmer sent to town 3 loads of hay. One weighed $1\frac{3}{4}$ tons, another $1\frac{5}{8}$ tons and the other $1\frac{2}{3}$ tons. How many tons did he send in all?

4. Which load was the heaviest, and how much heavier than each of the others was it?

5. A boy buys papers at $1\frac{2}{5}$¢ each, and sells them at 2¢ each. How much does he make on 25 papers?

Multiplication of Fractions. The first process is the multiplication of a fraction by a whole number.

(1) A newsboy makes $\frac{2}{5}$¢ on each paper he sells. He sells 12 papers in $\frac{1}{2}$ hour. He makes $12\times\frac{2}{5}$¢ or $\frac{24}{5}$¢. One evening he sold 60 papers. He made $60\times\frac{2}{5}$¢ or $\frac{120}{5}$¢ or 24¢.

(2) A school-store dealer bought 1 dozen pencils at $\frac{3}{5}$¢ for each pencil. He spent $12\times\frac{3}{5}$¢ or $\frac{36}{5}$¢ or $7\frac{1}{5}$¢.

(3) $8\times\frac{2}{5}=\frac{8\times 2}{5}=\frac{16}{5}=3\frac{1}{5}$

(4) $9\times\frac{4}{7}=\frac{9\times 4}{7}=\frac{36}{7}=5\frac{1}{7}$

(5) $6\times\frac{5}{12}=\frac{\overset{1}{\cancel{6}}\times 5}{\underset{2}{\cancel{12}}}=\frac{5}{2}=2\frac{1}{2}$

(6) $24\times\frac{5}{6}=\frac{\overset{4}{\cancel{24}}\times 5}{\underset{1}{\cancel{6}}}=20$

(7) $27\times\frac{4}{9}=\frac{\overset{3}{\cancel{27}}\times 4}{\underset{1}{\cancel{9}}}=12$

Cancel when possible to shorten the work. Reduce answers to whole or mixed numbers.

(8) $\frac{2}{3}$ of $27=\frac{2\times\overset{9}{\cancel{27}}}{\underset{1}{\cancel{3}}}=18$

(9) $\frac{7}{8}$ of $40=\frac{7\times\overset{5}{\cancel{40}}}{\underset{1}{\cancel{8}}}=35$

(10) $\frac{2}{3}$ of $16=\frac{2\times 16}{3}=\frac{32}{3}=10\frac{2}{3}$

Taking a fractional part of a number, as $\frac{2}{3}$ of 27, is called *multiplication of a whole number by a fraction.* But this is the same as multiplication of a fraction by a whole number, and the processes are the same as shown above.

The next step is multiplication of a fraction by a fraction, as $\frac{1}{2}$ of $\frac{1}{3}$. This process is illustrated in Fig. 15.

⅓	⅓	⅓
½ of ⅓=⅙	⅙	⅙
½ of ⅓=⅙	⅙	⅙

FIG. 15

(a) $\frac{1}{4}$ of $\frac{1}{5}=\frac{1}{20}$
(b) $\frac{3}{4}$ of $\frac{1}{5}=\frac{3}{20}$
(c) $\frac{3}{4}$ of $\frac{2}{5}=\frac{6}{20}$
(d) $\frac{3}{4}$ of $\frac{3}{5}=\frac{9}{20}$

Study Fig. 16. Note that each of the small divisions is equal to the product of ¼ by ⅕.

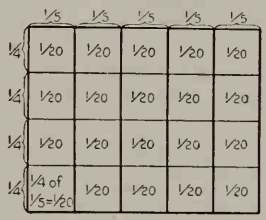


FIG. 16

$$\frac{1}{8} \text{ of } 16\tfrac{1}{21} = \frac{1}{8} \times 16\tfrac{1}{21} = \frac{\cancel{7} \times \cancel{16}}{\cancel{8} \times \cancel{21}} = \frac{2}{3}$$

$$14\tfrac{1}{17} \times 3\tfrac{1}{7} = \frac{\cancel{14} \times \cancel{24}}{\cancel{17} \times \cancel{7}} = 4$$

Cancel when possible, as above.

Then follows the multiplication of mixed numbers.

(1) A farmer sells milk at 8½ cents a quart. He sells 9 quarts one day. What are his receipts?

He receives for his milk $9 \times 8\frac{1}{2}¢$ or 75¢. $(9 \times 8) + (9 \times \frac{1}{2}) = 72 + 3 = 75$.

(2) What will 13 feet of hose cost at 16⅔¢ per foot?

$$\text{Cost} = 13 \times 16\tfrac{2}{3}¢ = 216\tfrac{2}{3}¢$$

$$\begin{array}{r} 16\frac{2}{3} \\ 13 \\ \hline 48 \\ 16 \\ \hline 208\frac{2}{3} \end{array} = 216\frac{2}{3}$$

(3) What is the area of a flower-bed 5 feet long and 3¾ feet wide? (See Fig. 17.)

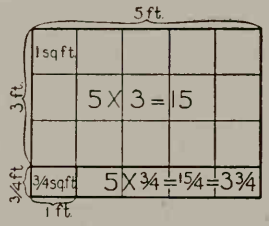


FIG. 17

Length = 5 ft.
Width = 3¾ ft.
Area in sq. ft. = $5 \times 3\frac{3}{4} = 18\frac{3}{4}$

Construct other diagrams similar to the one shown in Fig. 17, showing the methods of solution of the following problems:

$3 \times 4\frac{1}{4}$
$7 \times 6\frac{2}{3}$

(4) How many square yards in a floor 6⅔ yards long and 5½ yards wide? (See Fig. 18.)

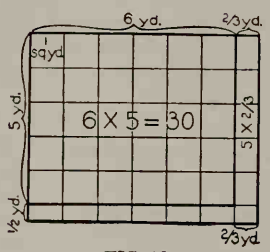


FIG. 18

Length = 6⅔ yd.
Width = 5½ yd.
Area in sq. yd. = $(6 \times 5) + (6 \times \frac{1}{2}) + (5 \times \frac{2}{3}) + (\frac{1}{2} \times \frac{2}{3})$
Area in sq. yd. = $30 + 3 + 3\frac{1}{3} + \frac{1}{3} = 36\frac{2}{3}$

The full process is shown below:

$$\begin{array}{r} 6\frac{2}{3} \\ 5\frac{1}{2} \\ \hline 30 \\ 3\frac{1}{3} \\ 3 \\ \frac{1}{3} \\ \hline 36\frac{2}{3} \end{array}$$

$8\frac{2}{5} \times 4\frac{1}{2} = n$

$$\begin{array}{r} 8\frac{2}{5} \\ 4\frac{1}{2} \\ \hline 32 \\ 1\frac{3}{5} \\ \frac{4}{5} \\ \hline 37\frac{4}{5} \end{array}$$

(1) $4 \times 8 = 32$
(2) $4 \times \frac{2}{5} = 1\frac{3}{5}$
(3) $\frac{1}{2} \times 8 = 4$
(4) $\frac{1}{2} \times \frac{2}{5} = \frac{1}{5}$

A mixed number is multiplied by a mixed number in another way, namely, by *reducing both mixed numbers to fractions, and multiplying;* for example, $8\frac{2}{5} \times 4\frac{1}{2} = \frac{\overset{21}{\cancel{42}}}{\cancel{5}} \times \frac{9}{\cancel{2}_{1}} = 18\frac{9}{5} = 37\frac{4}{5}$.

Division of a Fraction by a Whole Number. (1) ¾ of an acre of land is to be planted in lettuce, onions and radishes, giving to the vegetables equal spaces. What amount of land is planted in each?

⅓ of ¾ A. = ¼ A., or ¾ A. $\div 3 = \frac{1}{4}$ A.

(2) A man gives his wife ⅜ of his fortune, and divides the rest equally between his two sons. What part of the fortune does each son receive?

½ of ⅜ = 2/7, or $\frac{3}{7} \div 2 = \frac{2}{7}$.
¼ of 8/9 = 2/9, or $\frac{8}{9} \div 4 = \frac{2}{9}$
⅐ of $1\frac{1}{19} = 2\frac{1}{19}$, or $1\frac{1}{19} \div 7 = 2\frac{1}{19}$

½ of ⅐ = 1/14; ½ of 3/7 = 3/14
$\frac{1}{7} \div 2 = \frac{1}{14}$; $\frac{3}{7} \div 2 = \frac{3}{14}$
¼ of ⅕ = 1/20; ¼ of 3/5 = 3/20
$\frac{1}{5} \div 4 = \frac{1}{20}$; $\frac{3}{5} \div 4 = \frac{3}{20}$

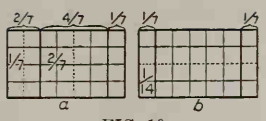


FIG. 19

See that $\frac{1}{2}$ of $\frac{2}{7}=\frac{1}{7}$

$\frac{1}{2}$ of $\frac{4}{7}=\frac{2}{7}$. (Fig. 19, *a*.)

See that $\frac{1}{2}$ of $\frac{1}{7}=\frac{1}{14}$. (Fig. 19, *b*.)

$\frac{1}{2}$ of $\frac{3}{7}=\frac{3}{14}$

$\frac{1}{2}$ of $\frac{3}{7}=\frac{1\frac{1}{2}}{7}$

$\frac{1}{2}$ of $\frac{5}{7}=\frac{5}{14}$

$\frac{1}{2}$ of $\frac{5}{7}=\frac{2\frac{1}{2}}{7}$

To divide a fraction by a whole number (1) divide the numerator by the integer; as, $\frac{4}{7}\div 2=\frac{2}{7}$; or *(2) Multiply the denominator by the integer;* as, $\frac{5}{7}\div 2=\frac{5}{14}$. We use the first method when the numerator is *divisible* by the integer, but either method may be used with any fraction; for example, $\frac{4}{7}\div 2=\frac{1}{2}$ of $\frac{4}{7}=\frac{4}{14}=\frac{2}{7}$; $\frac{5}{7}\div 2=\frac{2\frac{1}{2}}{7}$, which reduced equals $\frac{5}{14}$.

It is simple in both cases to look upon the problem as finding a fractional part of a fraction; as,

$\frac{4}{5}\div 2=\frac{1}{2}$ of $\frac{4}{5}=\frac{2}{5}$

$\frac{4}{5}\div 3=\frac{1}{3}$ of $\frac{4}{5}=\frac{4}{15}$

$\frac{7}{9}\div 14=\frac{1}{14}$ of $\frac{1}{9}=\frac{1}{18}$

$\frac{15}{17}\div 10=\frac{1}{10}$ of $\frac{3}{17}=\frac{3}{34}$

Division of a Mixed Number by a Whole Number. (1) A housekeeper has a piece of tapestry $6\frac{2}{3}$ feet long for two draperies. How long can she make them?

$\frac{1}{2}$ of $6\frac{2}{3}$ ft. $=3\frac{1}{3}$ ft.

$6\frac{2}{3}$ ft. $\div 2=3\frac{1}{3}$ ft.

(2) Jane divides a Christmas ribbon $8\frac{8}{9}$ yards long into four equal pieces. How long is each? (See Fig. 20.)

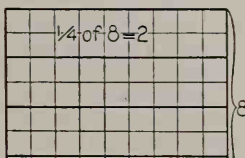


FIG. 20

$\frac{1}{4}$ of $8\frac{8}{9}$ yd. $=2\frac{2}{9}$ yd. $8\frac{8}{9}\div 4=2\frac{2}{9}$

Make other diagrams showing methods of solving similar problems.

(3) $10\frac{5}{8}\div 5=n$.

$10\frac{5}{8}\div 5=2\frac{1}{8}$. (Fig. 21.)

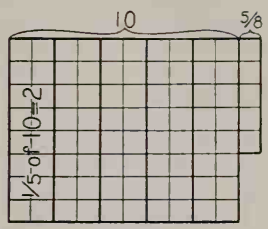


FIG. 21

From the above problems the following rule may be deduced:

To divide a mixed number by an integer, when the integer of the mixed number is divisible by the divisor, divide it, and then divide the fractional part of the mixed number by the divisor, and combine the two answers.

(1) $17\frac{1}{2}\div 5=n$ $\quad 5\overline{)17\frac{1}{2}}$ $\quad 3\frac{2\frac{1}{2}}{5}=3\frac{1}{2}$

(2) $15\frac{5}{8}\div 7=2\frac{1\frac{5}{8}}{7}=2\frac{5}{56}$

(3) $825\frac{3}{4}\div 45=n$ $\quad 18\frac{15\frac{3}{4}}{45}=18\frac{7}{20}$

$45\overline{)825\frac{3}{4}}$ $\quad \frac{45}{375}$ $\quad \frac{360}{15\frac{3}{4}}$ $\quad \frac{15\frac{3}{4}\times 4}{45\times 4}=\frac{63}{180}=\frac{7}{20}$

(4) $152\frac{2}{3}\div 16=n$ $\quad 9\frac{8\frac{2}{3}}{16}=9\frac{13}{24}$

$16\overline{)152\frac{2}{3}}$ $\quad \frac{144}{8\frac{2}{3}}$ $\quad \frac{8\frac{2}{3}\times 3}{16\times 3}=\frac{26}{48}=\frac{13}{24}$

In solving these four problems the following rule is applied:

Divide as in whole numbers, and reduce the complex fraction at the end.

A third method is shown in the following rule:

Reduce the mixed number to a fraction, and divide; as, $1\frac{1}{5}\div 3=\frac{6}{5}\div 3=\frac{6}{15}$; $7\frac{1}{9}\div 18=\frac{1}{18}$ of $\frac{64}{9}=\frac{64}{162}$.

Solve the following:

1. $\frac{1}{8}$ of $16\frac{1}{19}=n$
2. $8\frac{1}{7}\div 2=n$
3. $5\frac{1}{12}\div 5=n$
4. $\frac{1}{7}$ of $14\frac{1}{31}=n$
5. $\frac{1}{4}$ of $5\frac{1}{6}=n$
6. $12\frac{1}{25}\div 24=n$
7. $3\frac{1}{19}\div 78=n$
8. $12\frac{2}{5}$ qt. $\div 19=n$
9. $9\frac{3}{5}$ mi. $\div 8=n$
10. $6\frac{2}{3}\div 10=n$

11. A family uses $5\frac{5}{8}$ pounds coffee in nine weeks. Find average used per week.

12. Find length of a rectangular floor 18 feet wide, whose area is $230\frac{2}{5}$ square feet.

13. The following are the heights of 4 boys. Find their average height: $4\frac{1}{3}$ feet, $4\frac{3}{4}$ feet, $5\frac{5}{6}$ feet, $5\frac{1}{2}$ feet.

Division by a Fraction. The following problems illustrate the principles involved in dividing numbers by fractions.

How many ⅓ feet in 1 foot? There are 3.

How many ⅓ feet in 2 feet? There are 2×3 or 6.

$1\div\frac{1}{3}=3$
$2\div\frac{1}{3}=2\times3=6$
$10\div\frac{1}{3}=10\times3=30$
$5\frac{1}{3}\div\frac{1}{3}=5\frac{1}{3}\times3=16$
$4\frac{1}{2}\div\frac{1}{3}=4\frac{1}{2}\times3=13\frac{1}{2}$

In 1 there are 3 one-thirds. In 2 there are 2 times as many one-thirds as in 1, or 2×3 or 6. In $5\frac{1}{3}$ there are $5\frac{1}{3}$ times as many one-thirds as in 1, or $5\frac{1}{3}\times3$ or 16. Such problems should be read, "How many ⅓'s in 1? In 2? In 10? In $5\frac{1}{3}$?" Do not say, "1 divided by ⅓ equals what? $5\frac{1}{3}$ divided by ⅓ equals what?" until the child is very familiar with division. The phrase "divide by" is a conventional expression which clouds the meaning of the question.

Fig. 22 (below) illustrates the number of ⅔'s and ⅓'s in ⅔'s.

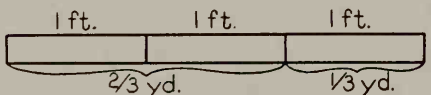


FIG. 22

(a) $1\div\frac{2}{3}=1\frac{1}{2}$
$3\div\frac{2}{3}=3\times1\frac{1}{2}=4\frac{1}{2}$
$16\div\frac{2}{3}=16\times1\frac{1}{2}=24.$

How many ⅖ mile in 1 mile? (See Fig. 23.)

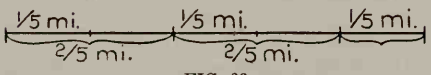


FIG. 23

There are $2\frac{1}{2}$ *two-fifths miles* in 1 mile.

(b) $1\div\frac{2}{5}=2\frac{1}{2}$
$3\div\frac{2}{5}=3\times2\frac{1}{2}=7\frac{1}{2}$
$16\div\frac{2}{5}=16\times2\frac{1}{2}=40$

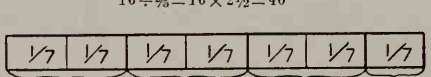


FIG. 24

(c) $1\div\frac{2}{7}=3\frac{1}{2}$
(d) $1\div\frac{3}{4}=1\frac{1}{3}$
(e) $1\div\frac{1}{9}=2\frac{1}{4}$

These processes may all be illustrated by drawings like Fig. 24, which applies to (c).

The answers above in (a), (b), (c), (d) and (e) may be shown as *fractions* instead of as *mixed numbers*, and we have:

$1\div\frac{2}{3}=\frac{3}{2}$
$1\div\frac{2}{5}=\frac{5}{2}$
$1\div\frac{2}{7}=\frac{7}{2}$
$1\div\frac{3}{4}=\frac{4}{3}$
$1\div\frac{1}{9}=\frac{9}{1}$

From this may be deduced the rule:

1 divided by a fraction is the reciprocal of that fraction or the inverted form of that fraction.

$1\div\frac{1}{9}=\frac{9}{1}$

$2\div\frac{1}{9}=\overset{1}{\cancel{2}}\times\frac{9}{\underset{2}{\cancel{4}}}=4\frac{1}{2}$

$20\div\frac{1}{9}=\overset{5}{\cancel{20}}\times\frac{9}{1}=45$

$6\frac{2}{3}\div\frac{1}{9}=6\frac{2}{3}\times\frac{9}{1}=\overset{5}{\cancel{20}}\times\frac{\overset{3}{\cancel{9}}}{1}=15$

$5\frac{1}{6}\div\frac{1}{9}=\underset{2}{\cancel{5\frac{1}{6}}}\text{ of }\overset{3}{\cancel{9}}=15\frac{1}{3}=17\frac{1}{3}$

$n\div\frac{1}{9}=n\times\frac{9}{1}=\frac{n\times9}{1}$

Any number divided by a fraction equals that number times the reciprocal of the fraction.

We may solve the problem of dividing by a fraction in another way; namely, by changing the dividend and divisor to a *common denominator* or expressing them in terms of the same *fractional unit.*

$12\div\frac{1}{3}=36\frac{1}{3}\div\frac{1}{3}=36$
$15\div\frac{3}{8}=120\frac{1}{8}\div\frac{3}{8}=40$
$2\frac{2}{5}\div\frac{3}{4}=12\frac{1}{5}\div\frac{3}{4}=48\frac{1}{20}\div15\frac{1}{20}=3\frac{1}{5}$
$\frac{2}{9}\div\frac{5}{6}=\frac{4}{18}\div\frac{15}{18}=\frac{4}{15}$

Dividing by a Mixed Number. Division by a mixed number is explained by the following problems:

$6\div2\frac{1}{2}=6\div\frac{5}{2}=6\times\frac{2}{5}=\frac{12}{5}=2\frac{2}{5}$

$6\frac{2}{3}\div3\frac{1}{5}=6\frac{2}{3}\div\frac{16}{5}=\overset{5}{\cancel{20}}\times\frac{5}{\underset{4}{\cancel{16}}}=\frac{25}{12}=2\frac{1}{12}$

This division becomes division by a fraction, as soon as we reduce the divisor to a fraction.

Problems. (1) At ⅖¢ a piece, how many papers can a boy buy for 60¢?

Number of papers $=60\div\frac{2}{5}=\overset{30}{\cancel{60}}\times\frac{5}{\underset{1}{\cancel{2}}}=150$

(2) Class badges are ⅜ yard long. How many badges can be supplied from a bolt (10 yards) of ribbon?

Number of badges $=10\div\frac{3}{8}=10\times\frac{8}{3}=\frac{80}{3}=26\frac{2}{3}$. There are 26 badges and a piece of ribbon ⅔ as long as a badge.

(3) $16\frac{1}{2}$ yards of silk are cut into remnants of $1\frac{1}{2}$ yards each. How many remnants are there?

Number of remnants $=16\frac{1}{2}\div1\frac{1}{2}=\frac{81}{2}\div\frac{9}{2}=9.$

(4) The circumference of a circle is, roughly, $3\frac{1}{7}$ times as long as the diameter. The boys have a game ring whose circumference is $39\frac{17}{21}$ feet. What is its diameter?

(5) Matting ¾ yard wide is used to cover the floor of a hall 18 yards wide. How many strips are required?

(6) A rectangle has an area of $\frac{3}{20}$ square inch; it is ⅖ inch wide. How long is it?

(7) How many jugs each holding 1¾ gallons can be filled from a barrel (31½ gallons)?

Complex Fractions. Nellie has 3 pieces of ribbon each ½ yard long. She gives Sarah one-half of the ribbon by giving her one piece and half of another piece. Sarah now has $\frac{1\frac{1}{2}}{2}$ of a yard, and Nellie has left $\frac{1\frac{1}{2}}{2}$ of a yard (see Fig. 25).

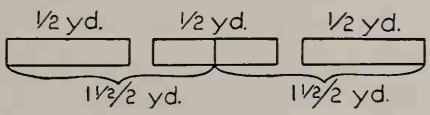


FIG. 25

A cake is cut by the baker into 8 equal parts. ⅜ is sold. Mrs. Hughes, going to the shop, buys ½ of what is left. What part of the cake does she get? She gets ½ of ⅝ or $\frac{2\frac{1}{2}}{8}$. What part of the cake is left? $\frac{2\frac{1}{2}}{8}$. (See Fig. 26.)

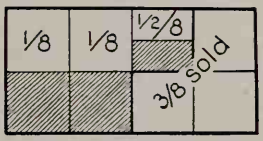


FIG. 26

½ of ⅞ = $\frac{3\frac{1}{2}}{8}$ ⅛ of ⅞ = $\frac{2\frac{1}{2}}{8}$

¼ of $\frac{9}{10}$ = $\frac{2\frac{1}{4}}{10}$ ⅕ of $\frac{22}{23}$ = $\frac{4\frac{2}{5}}{23}$

Study Fig. 27, below.

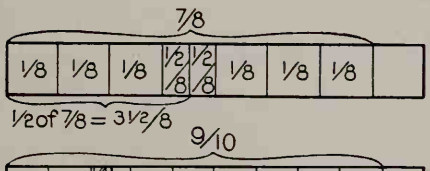


FIG. 27

Michael had $12 at Christmas. He spent $1 for a cap; $1½ for gloves for his mother; $3½ for shoes; $1¼ for neckties; $1¾ for candy, $3 for a turkey. What part of his money did he spend for each purchase?

Cost of cap $= \frac{1}{12}$ of his money

Cost of gloves $= \frac{1\frac{1}{2}}{12}$ " " "

Cost of shoes $= \frac{3\frac{1}{2}}{12}$ " " "

Cost of ties $= \frac{1\frac{1}{4}}{12}$ " " "

Cost of candy $= \frac{1\frac{3}{4}}{12}$ " " "

Cost of turkey $= \frac{3}{12}$ " " "

Cost of all $= \frac{12}{12}$ " " "

1 is what part of 7? Answer, $\frac{1}{7}$.

2 is what part of 7? Answer, $\frac{2}{7}$.

2½ is what part of 7? Answer, $\frac{2\frac{1}{2}}{7}$.

3⅕ is what part of 7? Answer, $\frac{3\frac{1}{5}}{7}$.

2½ months is what part of a year? Answer, $\frac{2\frac{1}{2}}{12}$.

6 mo. 10 da. is what part of a year? Answer, $\frac{6\frac{1}{3}}{12}$.

1 ft. 3 in. is what part of a yd.? Answer, $\frac{1\frac{1}{4}}{3}$.

2 pk. 3 qt. is what part of a bu.? Answer, $\frac{2\frac{3}{8}}{4}$.

Such fractions as those given above grew out of the conditions presented.

A fraction which has a fraction or a mixed number in either or both of its terms is called a complex fraction.

The complex fraction, despite its name, is a very simple and necessary tool in mathematics. It serves (1) to express *concisely* and readily *what* part one number is of another. For example, 1 ft. 9 in. is what part of 1 yd.? 9 in.=¾ ft. 1¾ ft.=$\frac{1\frac{3}{4}}{3}$ yd.

8 mo. 24 da. is what part of 1 yr.? Answer, $\frac{8\frac{1}{3}}{12}$.

When 8½ hr. is a day's work, what part of a day's wages should a man get who works 3¾ hr.? Answer, $\frac{3\frac{3}{4}}{8\frac{1}{2}}$.

The complex fraction serves (2) to express division. Divide 4⅚ yards of ribbon among 8 children. What part of a yard does each receive? Answer, $\frac{4\frac{5}{6}}{8}$.

A machine travels $2\frac{11}{12}$ miles in 2½ minutes. What is the rate per minute? Answer, $\frac{2\frac{11}{12}}{2\frac{1}{2}}$.

Reduction of Complex Fractions. The following problems illustrate the reduction of complex fractions:

$$\frac{4\frac{5}{6}\times 6}{8\times 6}=\frac{29}{48} \qquad \frac{2\frac{1}{2}\times 6}{4\frac{1}{3}\times 6}=\frac{15}{26}$$

$$\frac{2\frac{1}{2}\times 2}{7\times 2}=\frac{5}{14} \qquad \frac{8\frac{1}{5}\times 10}{12\frac{1}{2}\times 10}=\frac{82}{125}$$

$$\frac{1\frac{1}{3}\times 9}{3\times 9}=\frac{10}{27} \qquad \frac{4}{3\frac{1}{7}\times 7}=\frac{28}{22}=\frac{14}{11}$$

$$\frac{2\frac{3}{8}\times 8}{4\times 8}=\frac{19}{32} \qquad \frac{16\times 3}{9\frac{2}{3}\times 3}=\frac{48}{29}$$

$$\frac{\frac{1}{2}\times 2}{15\times 2}=\frac{1}{30} \qquad \frac{\frac{2}{5}\times 20}{\frac{3}{4}\times 20}=\frac{8}{15}$$

To reduce a complex fraction to a simple fraction: (1) *Multiply both terms by a number that will rid numerator and denominator of fraction. The simplest such number is the least common denominator of these fractions.*

(2) *Divide numerator by denominator;* as,

$$\frac{4\frac{1}{5}}{3}=3\frac{3}{5}\div 3=1\frac{1}{5}; \quad \frac{6}{2\frac{2}{5}}=6\div 1\frac{2}{5}=\frac{\overset{1}{\cancel{6}}}{1}\times\frac{5}{\underset{2}{\cancel{12}}}=5\frac{1}{2};$$

$$\frac{9\frac{1}{2}}{2\frac{7}{7}}=\frac{\overset{1}{\cancel{19}}}{2}\times\frac{7}{\underset{1}{\cancel{19}}}=7\frac{1}{2}.$$

(3) *Divide numerator and denominator by the same number; as,*

$$\frac{2\frac{1}{2}\div 2\frac{1}{2}}{5\div 2\frac{1}{2}}=\frac{1}{2} \qquad \frac{7\frac{1}{2}\div 2\frac{1}{2}}{12\frac{1}{2}\div 2\frac{1}{2}}=\frac{3}{5}$$

$$\frac{4\frac{1}{2}\div 4\frac{1}{2}}{13\frac{1}{2}\div 4\frac{1}{2}}=\frac{1}{3} \qquad \frac{12\frac{1}{2}\div 12\frac{1}{2}}{37\frac{1}{2}\div 12\frac{1}{2}}=\frac{1}{3}$$

A more complicated form of complex fractions is seen in such expressions as $\frac{2\frac{1}{2}+\frac{2}{3}}{3\frac{1}{2}-1\frac{1}{3}}$. This is simplified by multiplying both terms by the same number: $\frac{2\frac{1}{2}+\frac{2}{3}\times 6}{3\frac{1}{2}-1\frac{1}{3}\times 6}=\frac{15+4}{21-2}=\frac{19}{19}=1$. The third method is not generally applicable, as the divisor is not always apparent. The first method is generally the most satisfactory.

Problems. (1) 6 lb. 8 oz. is what part of 20 lb.? The part $=\frac{6\frac{1}{2}}{20}=1\frac{3}{40}$.

(2) Three ladies divided a bolt of ribbon (10 yd.) in this way: Mrs. R. took 3¾ yd., Mrs. M. took 4½ yd. and Mrs. Y. took 1¾ yd. For what part of the bolt should each one pay?

Mrs. R's part $=\frac{3\frac{3}{4}}{10}=\frac{15}{40}=\frac{3}{8}$

Mrs. M's part $=\frac{4\frac{1}{2}}{10}=\frac{9}{20}$

Mrs. Y's part $=\frac{1\frac{3}{4}}{10}=\frac{7}{40}$

(3) When a working day is 7½ hr., and the wages are $4.50, how much does a man lose who is off duty 1½ hr.? Loss $=\frac{1\frac{1}{2}}{7\frac{1}{2}}$ of 4.50=\frac{1}{5}$ of $4.50=$.90$.

(4) A piece of fine lace 21¼ inches long is marked to sell for $17. What part of the strip is 15 inches? How much would it cost?

(5) $2\frac{3}{5}\div 9\frac{3}{4}=\frac{2\frac{3}{5}}{9\frac{3}{4}}=n.$

(6) $\frac{2\frac{1}{2}}{3\frac{1}{3}}=n.$

(7) 6 months and 12 days is what part of a year? $\frac{6\frac{2}{5}}{12}=\frac{32}{60}=\frac{8}{15}$.

(8) 9 months and 20 days is what part of a year?

(9) If the interest on $8000 is $480 for a year, what should it be for 9 months and 20 days?

A Fraction as an Expressed Division. (1) Divide $2 equally among three men. What does each receive? Answer, $⅔. This fraction $\frac{2}{3}$ shows that $2 is divided into 3 equal parts, and each part is $⅔.

(2) Divide 5 yards of ribbon among 8 girls equally. This division is indicated by ⅝ yard. In ⅝ yard we see also what each girl receives; namely, ⅝ yard.

So a fraction is an (a) *indicated division,* and (b) the *answer to such division.*

$$7\div 8=\tfrac{7}{8}$$
$$13\div 4=13\tfrac{1}{4}$$
$$5\div 7=\tfrac{5}{7}$$
$$200\div 4=200\tfrac{1}{4}$$

The expression of division by the division sign (÷) should give way generally to the fraction form because (a) of its more concise form; and because (b) the quotient becomes evident as the problem is set down; for example, $2\div 9$, $\frac{2}{9}$.

Part Given to Find the Whole. Note in Fig. 28 that we have indicated the five equal parts of a whole.

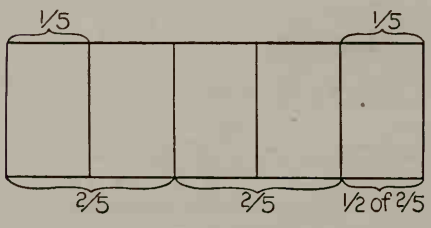


FIG. 28

⅖ of a bolt of linen is worth $19. What is it all worth?

From the above drawing we see that a whole bolt would be 2½ times as large as ⅖ of the bolt.

Solution:

Cost of ⅖ of bolt $=$ $19

Cost of bolt $=2\frac{1}{2}\times$ $19 $=$ $47½

Make a drawing, and show how many times one acre is as large as 3/16 of an acre. It is 5⅓ times as large.

$\frac{3}{16}$ of an acre of town land sold for $1650. At this rate what will an acre sell for?

Solution:

Cost of $\frac{3}{16}$ acre = $1650
Cost of 1 acre = $5\frac{1}{3} \times \$1650 = \$8800$

Or we may change the mixed number to a fraction and the first problem will appear thus:

Cost of $\frac{2}{5}$ bolt = $19
Cost of bolt = $\frac{5}{2} \times \$19 = \$95/2 = \$47\frac{1}{2}$

Such problems may also be analyzed through the fractional unit, as follows:

Cost of $\frac{2}{5}$ bolt = $19
Cost of $\frac{1}{5}$ bolt = $\$19/2 = \$9\frac{1}{2}$
Cost of bolt = $5 \times \$9\frac{1}{2} = \$47\frac{1}{2}$
Cost of $\frac{3}{16}$ acre = $1650
Cost of $\frac{1}{16}$ acre = $\$1650/3 = \$550$
Cost of 1 acre = $16 \times \$550 = \$8800$. A.H.

FRACTURE, *frak'ture,* a word taken from a Latin word meaning *break,* and used commonly to designate the breaking of a bone. There is the *simple* fracture, in which there is no communication between the broken bone and the outer air; the *compound* fracture, in which there does exist such communication; the *multiple* form, in which there is more than one break; the *comminuted,* in which the bone is splintered; and several others. Fractures may occur at any age, but the bones of very young persons and of very old persons are far more fragile and liable to breakage than are those of strong persons in middle life.

Many fractures are easily detected. There is intense pain, soreness or tenderness; swelling; an abnormal point of motion; and, when the ends of the bones are rubbed together, a curious crackling. In some bones, however, not all these symptoms can be detected after breakage, and only surgical examination or the X-ray can reveal the fracture. No one but a surgeon should attempt to reduce a fracture, and all that can be done until the arrival of a surgeon is to prevent any motion of the injured part.

FRA DIAVOLO, *frah de ah'vo lo* (?1770-1806), the popular name given to MICHELE PEZZA, an Italian bandit who was born at Calabria. As the leader of a band of desperadoes in the mountains of Calabria, he terrorized the entire country by his daring attacks and robberies. His barbarous cruelties and the fact that he had originally been a monk gained him the name of *Fra Diavolo,* which is Italian for *brother devil.* He was made a colonel by Ferdinand of Naples, with whom he united against the French. He was afterwards convicted of inciting a rebellion and was executed. Auber's opera, *Fra Diavolo,* is founded upon Pezza family traditions, but is not intended to be historically accurate.

FRAMINGHAM, *fraym'ing ham,* MASS., a city of Middlesex County, including within its limits the villages of Framingham Center, South Framingham, Saxonville and Nobscot. The Federal census of 1910 and an estimate in 1916 reported 12,948 and 13,982 inhabitants, respectively. The city is located in the central-eastern part of the state, twenty-one miles west of Boston, twenty-three miles northeast of Worcester and twenty-five miles south of Lowell. It is on the New York, New Haven & Hartford and the Boston & Albany railroads.

Framingham is the seat of a state normal school, the first in the United States, which was established at Lexington in 1839, removed to Newton in 1844, and to its present site in 1853. It also has an historical and natural history society, a library, one public and three private hospitals, an almshouse and a home for the aged. In 1916 the erection of a new Federal building was begun.

South Framingham is the principal business and banking center. It has large manufactories of paper tags, crepe paper, gummed labels, paper boxes, boots and shoes, and rubber and straw goods. Woolen yarns, wool blankets and worsted cloths are manufactured in Saxonville. Stoves, plows, steam boilers and farming implements are among the numerous other manufactures. The Dennison Tag Company has more than 2,500 employees.

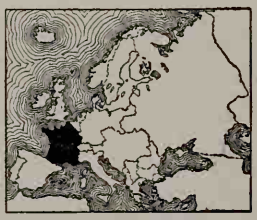
Framingham was first settled about 1640. It was named in honor of Framlingham, the English home of Governor Thomas Danforth. He once owned the land upon which the settlement was made, and the town was called Danforth's Plantation until 1700, when it was incorporated under its present name. R.E.K.

FRANC, *frank,* a silver coin adopted in 1795 as the monetary unit of France, in the same sense that the dollar is the unit of United States and Canada money. It is equivalent to 19.3 cents. The franc is divided into 100 centimes, but the smallest coin in circulation in France is the five centime piece, called a *sou.* Silver coins of five, two, one and half a franc are still in use, though gold is the standard, represented by coins of ten and twenty francs. Practically the same coin has been adopted as the monetary unit of Italy, where it is called a *lira;* of Greece, where it is known as a *drachma;* and also of Belgium, where the French term *franc* is used.

FRANCE, one of the great powers of Europe, the only large republic on the Continent. Since France first became truly a nation, almost a thousand years ago, there has been scarcely a movement of importance in Europe in which it has not taken a prominent part, and at intervals it has been, over long periods, the dominant nation. To many who are not close students the very name of France, and especially of its capital, Paris, stands for lightness, gayety and lack of depth; "the French," say the very old geographies, "are a frivolous people, fond of dancing and light wines." But the nation has proved in the crises of its history that underneath the pleasure-loving exterior there is most remarkable depth and stability. The *fleur-de-lis,* or iris flower, which is the national emblem, stands for very real achievements in peace, as in war.

Location and Size. Save for the peninsula of Spain, France is the westernmost portion of continental Europe. It lies between 4° 48′ west and 7° 31′ east longitude and 42° 20′ and 51° 5′ north latitude, and is thus in about the same latitude as the Great Lakes region of North America. Though distinctly a part of the continental mass, France is in a sense as much of an isolated unit as an island, for almost everywhere it has natural boundaries—mountains or sea. On the north are the English Channel and the Strait of Dover; on the west the Bay of Biscay, the Atlantic and the English Channel; on the south, Spain and the Mediterranean; on the east Italy, Switzerland and Germany, and on the northeast, Belgium. The boundary between Spain and France is the almost impassable wall of the Pyrenees, while on the east are various Alpine ranges, the Jura and the Vosges. In general, the dividing line between France and the neighboring states follows the crest of the mountains.

This great power, fourth in area among the countries of Europe, is about the size of the Canadian province of Yukon, and about one-fifth smaller than Texas; the total area is 207,054 square miles, just a little less than that of the German Empire. Of its total mileage, 3,367 square miles is comprised in the island of Corsica (which see). The greatest north-and-south length is 600 miles, the greatest breadth about 525 miles, and the very longest dimension, the diagonal from Brest in the extreme northwest to Mentone in the southeast, is almost 680 miles. That is, one may travel in a straight line across France less than the distance from Chicago to Philadelphia. To a mind accustomed to the "magnificent distances" of North America, those of France seem small, but the country has been large enough to work out not only a remarkable history but phenomenal industries as well.


LOCATION MAP

The People. Almost everyone feels a peculiar interest in the French people. They stand for something very distinctive, something which other peoples strive for, at times, but never attain. For the French have received heritages from various stocks, and the national character combines the vivacity, brilliance and quickness of the old Celtic races with the practical sense, industry and talent for organization of the Northern, or Teutonic, peoples. A surface survey of the history of the late eighteenth and the nineteenth centuries might indicate from the frequent revolutions and changes of government that the French are fickle and fond of excitement, at whatever cost; but the true cause for these movements is quite otherwise, and the French are a people peculiarly fond of peace and of order.

In their physical characteristics the peoples of the different parts of the country vary considerably, though intermarriage through the centuries has made these variations less dis-

tinct. The inhabitants of the northern districts, however, are still predominantly of the tall, fair-haired, blue-eyed type, obviously related to the Scandinavians and Teutons who long ago made that part of the country their home, while to the south and west are to be found the short stature, dark hair and dark eyes which speak of Latin origin. All the people speak French, but in the northwest the old Breton tongue is still used, while Flemish, Italian and the peculiar Basque language are the common speech in some of the border regions (see FRENCH LANGUAGE).

The population of France, according to the census of 1911, was 39,601,509. The War of the Nations sadly decreased this number, but how great that difference is cannot be known until the full story of the struggle is unfolded. The statistics here, as in the paragraphs on the industries, of necessity relate to conditions before August, 1914, for just what changes have been made by that gigantic struggle it will be impossible to say until after the smoke has lifted from Europe's carnage. Among the states of Europe, Austria-Hungary, Germany, the United Kingdom and Russia surpass France in population, and Italy almost equals it. As regards density of population France stands eighth among the states of Europe, having 191.19 people to the square mile. Compared with the United States as a whole, with thirty-one to the square mile, France is very thickly-settled. New York state almost exactly equals it in the number of persons to the square mile.

No other great state of Europe has had within the last century so small an increase in population, whether actual or proportionate increase be counted. A hundred years ago France had over 30,000,000 inhabitants and England and Wales had but 12,000,000; the population of England and Wales has increased since then to over 36,070,000, a gain of two hundred per cent, while France has gained less than thirty per cent, and of that by far the greater increase took place in the first half of the period. There have been wars, it is true, which have lessened the population, and the cession to Germany of Alsace-Lorraine in 1871 made a notable decrease, but in general the slow growth is due to the very low birthrate of France—the lowest of all the countries of the world, so far as is known. In some years, as in 1911, for instance, the number of deaths has been greater than the number of births, but in general the latter is slightly in excess.

Frenchmen do not have in very great measure the tendency to emigrate, and the country is not drained in that manner as is Ireland; on the other hand, immigration to France has increased, as there were at the last census 1,132,696 foreigners in the country.

France shows, like almost every other country, a toward-the-city trend which the "back-to-the-land" slogan has not yet conquered.

A RURAL HOME

At the middle of the nineteenth century, little more than half a century ago, over three-fourths of the inhabitants of France lived under rural conditions—that is, on farms or in small villages; to-day almost half of the people are urban, and the cities are growing at the expense of the country. There is no danger of the French peasant's, whose wrongs and struggles have played so large a part in French history, becoming extinct, for he is too necessary; but he is much less in the majority than formerly.

Physical Features

The Coast. Roughly speaking, France is hexagonal in shape, and of its six sides three front the sea. The coast line, rather more than half of the total frontier, is about 1,950 miles, but in this very considerable stretch good harbors are comparatively few. Time was when the greatest advantage a country could have was a shore line on the Mediterranean, that great waterway of the ancient world, and France has felt and still feels the benefit of this contact, profiting largely from its easy access to the Orient and to Africa. The finest French harbor, Marseilles, is on this Mediterranean coast, and to the east of it are other

good harbors, Toulon, Cannes and Nice. It is this shore region, where the Alps run down almost to the sea and leave but a narrow strip, bright with sun and overgrown with almost tropic vegetation, which bears the name of the *Riviera,* and is one of the most popular resort regions of Europe.

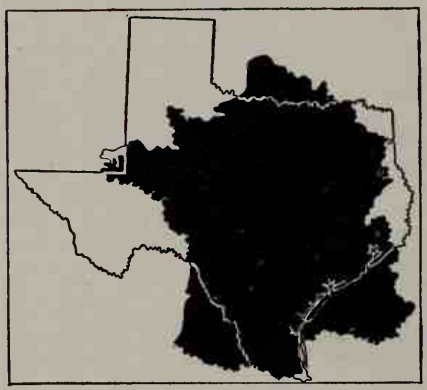
The western part of the Mediterranean coast, comprising the great sweeping Gulf of the Lion, is inhospitable, either by reason of rocks or of sandy dunes, and the southern part of the Atlantic seaboard, on the west, affords no harbors. Farther north is an island-fringed shore with occasional harbors, while in the northwest is the Breton "savage coast," as it is called, which hurls back the sea from its rocky cliffs. On the north the chief port is Cherbourg, on the peninsula of Cotentin in Normandy, with its breakwater-protected harbor, a great port of call for ocean steamships.

Highlands and Lowlands. France has some of the highest peaks of Europe and some, or at least one, of the most famous in the world (see below), but these are all on the border lines and are thus not dominating features of the landscape. Very simply stated, France consists of a northern and western lowland section; a south-central plateau; and, in the south and southeast highland regions sloping toward the Pyrenees and the Alps. Between the great plateau and the Alps runs the deep valley of the Rhone. The average height of the country above sea level is about 1,000 feet.

Considerably below this average is the northern and western plain, which has a mean elevation of somewhat less than 650 feet. It is broken by a few hilly tracts in Brittany and Normandy, nowhere over 1,400 feet in altitude, and by occasional rounded hillocks called *bocages,* or groves, because of the trees which cover them. The south-central plateau is a region of intermittent highlands and old volcanic mountains, known as the Cévennes (which see). Its greatest elevation, Mont Dore, is 6,188 feet, and it slopes gradually toward the northwest, melting at last into the plain of the north and west. If the ocean were to rise 660 feet, the northern and western limits of this plateau region would form the Atlantic seacoast of France, with only occasional islands at some distance from the shore.

There are picturesque regions in the plateau country, rich plains and beautiful vineyard-grown valleys in the lowland country, but the really wonderful beauties of France are on its frontiers. On the southeast rise the Alps, the chief highlands of the country, which attain their greatest height on the border line. Here, rising to an altitude of 15,781 feet, is Mont Blanc, that snow-crowned peak which many have lost their lives in trying to scale. This, however, is but one summit in the towering ranges, and there are numerous others which are but little lower, if less picturesque and less famous. There are also several celebrated passes, Mont Cenis and Mont Genèvre, which lead from France into Italy, each being more than 6,800 feet above sea level.

On the south border are the Pyrenees, the natural boundary between France and Spain, which differ from the Alps in being a continuous range, the "gaps" or notches between the peaks being but little lower than the peaks themselves. Very high and very difficult are the few passes which lead across this wild mountain region, and no railway has yet attempted to cross them, but access to Spain is gained along the coastal strips at the ends. The culminating peak of the Pyrenees in France is Pic Long, 10,475 feet in height.



COMPARATIVE AREAS

Texas is so much larger than France that if the latter could be shaped differently and placed as an island in a sea as large as Texas it would not be visible from any point on the mainland.

Rivers. France has many rivers—about two hundred which are navigable, in part at least; but its four great streams are the Rhone, the Garonne, the Loire and the Seine. The Rhone, whose valley, as noted above, lies deep-carved between the plateau and the Alps, drains with its tributaries all the southeastern portion of the country, carrying to the sea a greater volume of water than any other French river. It rises in the Alps of Switzerland, and its two

chief branches, the Isère and the Durance, also have Alpine sources. The other three great rivers, to the west of the watershed, empty into the Atlantic. The Loire, the longest river of France and the one with the largest drainage basin, rises in the Cévennes, curves northward toward the sea through the plateau region, and ends in a wide estuary; the Garonne rises in Spain, finds its way along the edge of the great plateau, and after receiving a number of tributaries flows northwest and finally broadens into the estuary of the Gironde. These last two rivers are subject to disastrous floods and are in places obstructed by sandbanks. The Seine, which has the smallest basin of these four chief rivers, is the most valuable for navigation, forming with its tributaries and branching canals a great system of waterways over which a considerable part of the commerce passes. On this river Paris is situated.

France has few lakes, and these are of no great size. Lake Geneva, in the Alpine country, forms part of its boundary for thirty-two miles, but belongs to Switzerland. Near the coast in certain regions are numerous brackish lagoons or inland bays, but these have neither beauty nor any particular importance.

Climate Conditions. As a whole, France has a mild and even climate, due to its bordering seas, but there are very noticeable variations in the different parts of the country. The western coast regions are warm and damp, with a small annual range of temperature, but in the interior, and especially in the extreme east, the contrast between summer and winter is much more sharp. The central plateau has a rather bleak, unattractive climate, with high winds and cold winters, but just over the ridge, on the Mediterranean coast, is a delightful region with a subtropical climate—a region which with its olives and oranges seems more like Italy than like France. The average temperature for the year at Paris, in the north-central part, is 50°, that for July being 65° and that for January 36°.

The winds, which blow for the most part from the south and west, are warm and moisture-laden, and since no mountains near the coast force out the moisture, this is dropped fairly evenly over the country. Thirty inches is the average rainfall for all France, but a few regions in the mountains have forty, while a few districts in the northern plains have but ten.

Resources and Industries

As stated above, in the discussion of population, the statistics given of necessity have reference to conditions before the War of the Nations. How great will be the change and how long it will be before a normal state of affairs is reached cannot even be predicted now.

Agriculture. Primarily France is, and has been for centuries, an agricultural country, but until the nineteenth century there were vast areas of moor and heath and waste land. During that century, however, conditions changed, and at present less than one-twelfth of the land is waste. Most of the farms are small and are cultivated by their owners. The French farmers are by no means the stolid peasants of some of the other European countries, content with the antiquated methods practiced for centuries by their ancestors, but have always shown themselves progressive and ready to adopt the best scientific methods. As a result of this and of the favorable climate, French farms yield for the most part excellent returns. The plains of the north and northeast, with the valleys of the Rhone and Garonne, are the most productive regions. There is a national department of agriculture which not only provides courses in the public schools, but establishes special schools where the peasants may go for their training.

Crops. Among all the agricultural products of France there are two which stand out with special prominence—wheat and the vine. At least one-eighth of all the area of the country is annually under wheat, and no other European country except Russia raises as large a quantity of this important cereal. The peasants of France, unlike those of most European countries, do not live on the coarse "black bread," or rye bread, but have as their chief fare wheaten loaves. In all, France produces considerably more than one-third as much wheat as the United States. Oats is the cereal of second importance, and large crops of rye and barley are produced.

Vine-growing is perhaps the most characteristic industry of France. In Champagne, in Burgundy and near Bordeaux are raised the luscious grapes which yield the famous wines known by those names, and in other departments, particularly in the south, other varieties scarcely less satisfactory are grown. In good

years France is capable of producing almost half of the wine of the world, but French vine-growers have had a desperate struggle against the phylloxera, an insect whose ravages cause a formidable vine disease (see PHYLLOXERA). The only satisfactory method of combating this has been the grafting of French vines upon American stock. The cider output of France almost equals in quantity, though not in value, its wine production, and in Normandy and Brittany, in the north, apple trees are as characteristic a feature of the landscape as are the vines elsewhere. Other fruits are also grown in large quantities—plums, cherries and peaches in the northern districts and oranges and lemons on the sunny Mediterranean slopes; and nuts, especially chestnuts, which will grow where other trees will not, are of great importance. Chestnuts in France are not an occasional luxury, but are a staple food, the people of certain regions depending on them very largely. Another tree, to the cultivation of which much attention is paid, is the mulberry, which is grown not only for its fruit but for its leaves, on which the silkworms feed. Silkworm-growing, however, is decreasing.

Immense quantities of beets are grown, only three countries in the world surpassing France in the production of beet sugar; and tobacco, the cultivation of which is monopolized by the government, yields valuable returns.

Stock-raising. Grassland is comparatively scarce in France, and not enough stock is raised to satisfy the domestic needs. The animals most successfully grown are sheep, which yield an excellent quality of wool, and horses, in the improvement of which the government has helped largely, owing to the demand for good horses in the army. The peasants make much use of asses and mules.

Forests. France has not a very extensive wooded area, only about one-sixth of its surface being under forests. Many of these are forests in name only, being in fact but stretches of bush. Of the forest trees, with the exception of the chestnut which grows in beautiful luxuriance and renders picturesque many of the stream-sides, the most important are the beech, oak and elm, and in the mountain regions the pines and firs. It was the destruction of the forests in the mountains which made many of the rivers liable to floods, and the department of agriculture is doing its best to repair the damage by replanting, as well as to prevent the same mistake elsewhere.

The Mineral Yield. France is one of the fortunate countries which has a fairly large output of the two "staple" minerals, coal and iron. The coal beds are small—only about 2,100 square miles in extent, or one-twentieth the area of those of Illinois, but their production is extensive, over 40,000,000 tons being produced in a year. Most of this is bituminous coal, of good quality. It does not supply the needs of the country, and the imports of coal from the neighboring mines of Belgium and from England equal about half of the domestic yield. In the War of the Nations before the end of 1914 Germany had occupied the richest of France's coal and iron area.

In one of the western departments, Meurthe-et-Moselle, are some of the greatest iron mines in the world, and other regions yield lesser quantities. Only the United States, Germany and the United Kingdom produce more iron ore than France in normal times, or manufacture greater quantities of iron and steel. A large quantity of the ore smelted in the country, however, is imported.

Other metals—lead, zinc, copper, antimony and nickel—are mined in small quantities, but far more important than these are the marble and other building stones which are quarried in the Alps and the Pyrenees. Slate, also, of excellent quality, is obtained in large quantities. There are mines of rock salt, but the most of this mineral is evaporated from the lagoons and salt marshes along the coasts.

Manufactures. The location and extent of these have been largely determined by the position of the coal mines, or of the ports at which British coal is landed, for fuel transportation is not cheap in France. Of late years there has been a tendency in the manufacturing industries to seek the high mountain valleys, for there water power is available, and the electricity generated from it supplies all fuel deficiencies. French workmen have a peculiar skill rarely attained by the artisan-class in other countries, and various outputs of French factories are in great demand. Nowhere else are such exquisite laces and gauze, such tapestries and shawls and gloves produced; and certain regions make the most artistic glass and chinaware in the world.

Most important by all means are the textile manufactures, and among these the silk industry, which centers at Lyons, used to rank foremost. To-day, however, it is third, both woolen and cotton manufactures surpassing it, the former in the ratio of two and one-half

to one. Altogether, the textiles produced in a year are worth about $750,000,000. Next to the textile industries are those connected with metals. France manufactures comparatively little machinery, but its smaller metal products, whether of iron, steel, brass, silver or gold, have that special excellence of finish and that artistic touch so characteristically French. The making of wines and cider has been mentioned under the heading AGRICULTURE, and side by side with this has grown up the manufacture of beer.

Fisheries. These are extensive, employing about one hundred thousand men and having an annual value of over $30,000,000. Sardines, herring, mackerel and tunny are caught by tons, and on the west coast oyster-breeding is conducted on a large scale. The French fishermen do not content themselves with working the near-by waters. Their fishing fleets find their way to Iceland and even across the sea and carry back from the Newfoundland Banks millions of dollars worth of cod.

Transportation and Commerce. The United States, Germany, Russia and British India surpass France in length of railways, but no country surpasses it in speed and in excellence of service. The total mileage is about 30,400, and of this over one-fourth is owned by the state. All the other roads, at present owned by great companies, are under strict government control and will at the expiration of their franchises, about the middle of the twentieth century, became state property. Practically all of the great roads start from Paris and run toward the large towns.

France has a large and efficient system of canals, which with its rivers gives it about 7,100 miles of navigable waterway. The Atlantic is joined with the Mediterranean by means of a great canal, and most of the important rivers have canal connections with each other. There are also in the country great stretches of wonderful roads which have been in existence for centuries.

The total foreign trade of France amounts in a year to nearly $4,000,000,000, and of this imports make up somewhat more than half. These are chiefly grains, wood, raw cotton and silk, machinery, coal, wood, oil seeds and, strangely enough, wine; for France exports most of its own wine. The exports are cotton, woolen and silk goods, wine, clothes, Parisian articles and dairy products. In general it may be said that what is shipped from French ports is chiefly expensive manufactured products, while the incoming cargoes are of bulkier, cheaper raw materials. Great Britain, the United States, Belgium and Germany have had most of the French trade, but these conditions changed with the outbreak of the great war in 1914.

Social and Political Conditions

Education. No country of Europe has ever shown a keener interest in education than has France, especially in recent years, and the national system of education is an excellent one, capably administered. Formerly the schools were largely under the domination of the Roman Catholic Church, but in various ways that state of affairs has been done away with, chiefly through legislation. A large proportion of the girls who go beyond the elementary schools attend the convents, but boys are in far larger numbers sent to the secular schools, because government positions and certain professions are not open to those who have not attended state schools.

Education is free and compulsory between the ages of five and thirteen, and the system includes schools of all ranks, from the kindergarten, or "maternal school," which admits babies two years of age, to the highest university. Even in the primary and secondary schools boys and girls are taught separately, and the courses differ in many particulars, the girls' schools neglecting the ancient tongues and the more technical subjects and laying stress upon "cultural" studies. The secondary schools consist of the state colleges, or *lycées*, the communal colleges supported by the commune (see COMMUNE), and private schools, and even these latter are under the supervision of the minister of public instruction, for education is strongly centralized. For educational administrative purposes, the whole country is divided into seventeen districts, known as *académies*, and each of these has its own officers of instruction.

The state supports no fewer than fifteen universities, and there are special and professional schools of various kinds. One of the universities, that of Paris, has an enrollment of over 17,000 yearly.

Literature and Language. The literature and language of the nation are described under the titles, FRENCH LANGUAGE and FRENCH LIT-

ERATURE, in their alphabetical places in this volume.

Religion. By far the larger part of the inhabitants of France belong to the Roman Catholic Church—nearly 37,000,000, it is estimated; there are about 600,000 Protestants and 70,000 Jews. Previous to 1906 the state paid toward the support of all the Churches, the total amount expended annually being approximately $10,000,000; but in that year the relations between Church and State were severed, and each Church was thrown on its own resources. All beliefs are tolerated by the government.

Government. France is a republic, and is governed by a constitution which in the main dates from 1875. This constitution is not a single document, like that of the United States, but a series of laws and amendments, and it has not as its central motive the securing of the liberties of the people.

The executive head of the government, the President, is chosen not by popular vote, but by the two houses of Parliament. His term of office is seven years; he may be reëlected, but no President has served two full terms. He has a council of ministers, in theory appointed by himself, but in reality by the leader of the majority in the lower house, and these ministers are responsible to the National Assembly, and go out of office when their measures are defeated. Thus the system is much more like that of Great Britain than of the United States. The number of ministers, each of whom presides over a department, varies from time to time.

The National Assembly consists of two houses, the Senate and the Chamber of Deputies. The powers of these two bodies are approximately equal, except that only the lower house may originate revenue measures, in this respect following the example of the United States. The Senate comprises 300 members, chosen by electoral colleges composed of certain officials of the various departments, or states, into which the country is divided. The term of senators is nine years, and one-third of the terms expires every three years. Members of the Chamber of Deputies are chosen by universal suffrage, and hold office for four years. Their number varies, but in 1914 it was 597.

The judicial department consists of a series of courts, of which the highest is the Court of Cassation, at Paris, with its president, three presidents of sections, and forty-five judges. Below this are twenty-six courts of appeal, which try cases from the district or *arrondissements* courts, these in turn being engaged with cases from the lower canton courts. Police courts may try without jury any case which does not involve a heavier sentence than five years' imprisonment.

Local Government. For local administration purposes France is divided into eighty-seven departments, at the head of each of which is a *prefect,* appointed by the President of the republic and assisted by an elected general council. Below the departments are the arrondissements, 362 in number, each with a subprefect at its head; and below the arrondissements are the cantons. The smallest units for local government are the communes, of which there are about twelve to each canton. Each commune has an elected municipal council, and a mayor chosen by that body. A commune may be a part of a large town, a single smaller town, or several little villages. The most characteristic feature of local government in France is its direct dependence on the central or national government.

Colonies. The French colonies have an area vastly greater than that of the home country, and a population considerably larger. The following table gives statistics for them in the years before the war, some of the figures being but estimates, especially as regards population statistics:

COLONIAL POSSESSIONS	AREA	POPULATION
Algeria	343,500	5,563,328
Tunis	48,000	1,929,003
French Morocco	219,000	3,000,000
French West Africa	1,478,000	11,626,000
Sahara country	924,400	467,000
French Equatorial Africa	555,598	8,904,000
French Somaliland	5,790	208,100
Madagascar	228,790	3,198,889
Mayotte and Comoro Islands	837	94,663
Réunion	970	173,822
French India	197	282,379
French Indo-China	310,058	16,990,220
Saint-Pierre and Miquelon	93	4,652
Guadeloupe	687	212,430
Martinique	381	184,084
French Guiana	30,463	49,009
Pacific Islands	15,253	152,010
Total	4,162,017	53,040,089

The government of most of these colonies is not self-supporting, and the home government, which retains control of many matters in the colonies, must also contribute toward their revenue. Some, as Algeria, for instance, have changed in this respect and are now profitable possessions.

National Defense. See ARMY; NAVY.

History of France

Early France, or Gaul. The Romans had always felt a keen interest in the land beyond the Alps, which they called *Gaul,* and more than one general had attempted invasions, but not until the time of Caesar was the territory really conquered. He led his armies across the Alps in 58 B. C., and for eight years was engaged in struggle with the brave peoples he found there; and it was his *Gallic Wars* which gave to the Romans their first definite ideas of Gaul. "All Gaul is divided into three parts" was the introduction of the ancient Roman, as it is of the modern schoolboy, to the history of Gaul (see GAUL).

The Celts or, as the Romans called them, Gauls, proved apt pupils, and the four provinces into which the land was divided became thoroughly Romanized. Savage customs died out; Roman dress, Roman gods and Roman customs were adopted, and a form of the "rustic Latin" replaced the old Celtic dialects. Especially noteworthy was the growth of cities —cities of which the Roman Empire itself need not have been ashamed. Christianity was introduced, and it is not too much to say that by the fourth century A. D. all Gaul had adopted the new doctrines, in name at least.

Enter, the Franks. This peaceful development was not allowed to go on indefinitely. As the Empire became more and more feeble, fierce German tribes began to cross the Rhine and settle in various parts of Gaul. In the fifth century the Visigoths, the Burgundians and the Franks made homes for themselves, and gradually the last-named tribe began to stand out most prominently (see FRANKS). Their young king, Clovis, in the latter part of the fifth century, defeated the Roman governor, and some years later overthrew the Visigothic power, thus gaining control of almost all of Gaul. Through the entreaties of his wife Clotilda he became a Christian, and his warriors crowded about him and were baptized with him just as they would have crowded about him in battle and died with him. The Christian Gauls accepted him as they could never have accepted a heathen conqueror, and gradually the territory became a Frankish realm, or to put it differently, *France* came into being.

Clovis, founder of the Merovingian dynasty, as it is called from Meroveus, grandfather of Clovis, died in 511, and his possessions were divided among his four sons, according to the Germanic custom, instead of being given to the eldest, in the Roman way; and though they were reunited in 558 they were again divided three years later, and a period of civil wars ensued. The Austrasians, or Eastern Franks, and the Neustrians, or Western Franks, kept up a constant struggle for dominance, during which the kings became mere royal figure-heads—"do-nothing kings" they were called—and the mayors-of-the-palace, or prime ministers in the different divisions, became the real rulers.

A New, Strong Dynasty. Finally, in the late seventh century, Pippin of Heristal, Austrasian mayor-of-the-palace, succeeded in getting into his own hands control of practically all the Frankish realm, though he never took the name of king. Neither did his son, Charles Martel, the famous conqueror of the Saracens in the Battle of Tours in 732 (see FIFTEEN DECISIVE BATTLES; TOURS); but Pippin the Short, Charles's son, shut the weak Merovingian king up in his palace and had himself declared king in 751. He was a strong ruler and did much to consolidate the kingdom for his celebrated son, Charlemagne, who made himself master of a realm much wider than ancient Gaul or modern France (see CHARLEMAGNE). His ambition was the restoration of the old Empire of Rome, and he called his kingdom the New Empire of the West. In no sense, however, was this great realm France, for it was in effect a German empire; and so it continued through the periods of division that followed Charlemagne's death, though it was during this time that the division into the modern kingdoms of France, Italy and Germany began. Many of the rulers during this troubled period were feeble, and it was during the reign of such a one that the Norsemen, or Normans, landed in Northern France and had to be bought off from their depredations by the surrender of that province which has ever since borne their name.

The Real France. Meanwhile the great nobles had been increasing their power at the expense of that of the king, which grew more and more shadowy, and in 987 one of the dukes, Hugh Capet, was able to drive from the throne the king of that western region which had begun to be called France, and to make himself king instead. He founded what is known as the Capetian Dynasty, which in some of its branches reigned in direct male

succession down to the time of the Revolution; for France has never, as has England, had a sovereign queen.

By adding his own ducal possessions to those of the Crown, Hugh Capet increased somewhat the royal power, but the great nobles continued practically independent under him and his early successors. The later Capetian kings were stronger, and aided by the Crusades, during which many of the nobles died or were impoverished, succeeded gradually and quietly in drawing more and more territory and power into their own hands.

The Kings of France. In a brief article such as this it is impossible to give in detail the events of every reign. All of the important kings are treated in separate articles, however, and by reading those in connection with the general discussion here given a very clear idea of French history in its main phases may be obtained. The following list gives the rulers of France, including the Presidents.

RULER	DATES OF REIGN
Hugh Capet	987- 996
Robert the Wise	996-1031
Henry I	1031-1060
Philip I	1060-1108
Louis VI, the Fat	1108-1137
Louis VII	1137-1180
Philip Augustus	1180-1223
Louis VIII	1223-1226
Louis IX (Saint Louis)	1226-1270
Philip III	1270-1285
Philip IV, the Fair	1285-1314
Louis X	1314-1316
John I	1316
Philip V, the Tall	1316-1322
Charles IV	1322-1328
Philip VI	1328-1350
John II, the Good	1350-1364
Charles V, the Wise	1364-1380
Charles VI	1380-1422
Charles VII	1422-1461
Louis XI	1461-1483
Charles VIII	1483-1498
Louis XII	1498-1515
Francis I	1515-1547
Henry II	1547-1559
Francis II	1559-1560
Charles IX	1560-1574
Henry III	1574-1589
Henry IV, the Great	1589-1610
Louis XIII	1610-1643
Louis XIV	1643-1715
Louis XV	1715-1774
Louis XVI	1774-1793
Republic	1793-1799
Consulate	1799-1804
Napoleon I, Emperor	1804-1814
Louis XVIII	1814-1824
Charles X	1824-1830
Louis Philippe	1830-1848
Republic, Louis Napoleon, President	1848-1852
Napoleon III, Emperor	1852-1871
Third Republic	
Thiers, Adolphe	1871-1873
MacMahon, Marshal	1873-1879
Grévy, Jules	1879-1887
Carnot, Sadi	1887-1894
Casimir-Périer	1894-1895
Faure, Félix	1895-1899
Loubet, Emile	1899-1906
Fallières, Clément Armand	1906-1913
Poincaré, Raymond	1913-

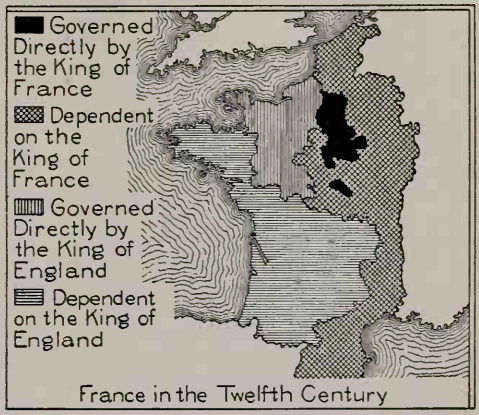
Growth of Royal Power. Of the later Capetian kings the strongest by all means were Philip Augustus, who nearly doubled the royal dominions; Louis IX, chiefly remembered for his part in the Crusades, but far more noteworthy because of his strong rule at home and his excellent personal qualities; and Philip IV. The direct line came to an end in 1328 with the death of Charles IV, and the branch line, the House of Valois (which see), succeeded to the throne in the person of Philip VI. The monarchy by this time was fairly well consolidated, and it had need to be, for there were troubled times ahead of it. Edward III of England resented Philip's succession, claiming the French throne for himself through his mother, and there began that series of conflicts known as the Hundred Years' War (which see). More than once it looked as though France might become a mere dependency of England, but through the heroic deeds of Joan of Arc (which see) the tide turned, and Charles VII found himself once more a king with a kingdom. All of France, which had been signed away to England by the insane Charles VI, was regained, with the exception of Calais, on the Strait of Dover, and France began to recover from the desolation the war had brought.

Much power had slipped back into the hands of the feudal nobles, but Louis XI, the first king after the close of the Hundred Years' War, was able to deal with such a state of affairs. His methods were ruthless, but his results were certain, and before the close of his reign he had laid the foundations for that absolute monarchy which was the outstanding characteristic of France in the centuries that followed. Charles the Bold, Duke of Burgundy, chief of the arrogant nobles, died in 1477, and his vast territories came to the Crown. Charles VIII, Louis's successor, married Anne of Brittany, and so gained that large province; then he attempted to extend his domains by an invasion of Italy. This was the first of those expeditions into Italy on the part of the French kings which had far-reaching results.

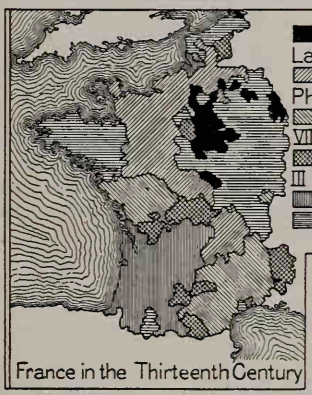
A Period of Wars. Under Francis I, one of the most elegant and accomplished princes of his time, France was very prominent in European affairs. The invasions of Italy were continued by him, at first with success, but when Emperor Charles V took the field against him Francis met defeat, and for a time was actually held a prisoner. To obtain his release he

DEVELOPMENT OF FRANCE

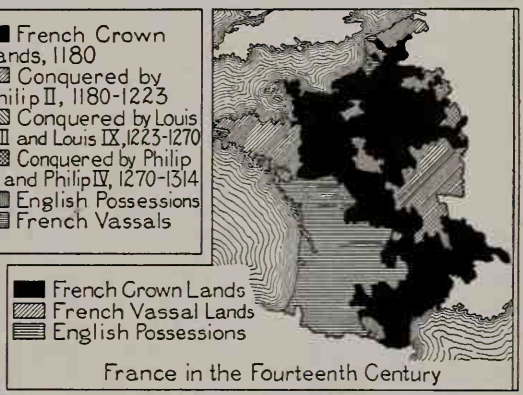
France, Time of Julius Caesar



France in the Twelfth Century

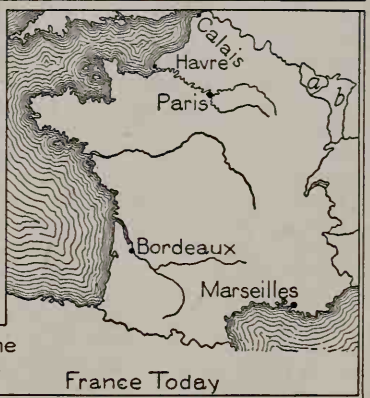


France in the Thirteenth Century



France in the Fourteenth Century

France under Napoleon, 1807-1813



a-Lorraine
b-Alsace
France Today

was forced to surrender all he had gained in Italy, and narrowly escaped giving up some of his French territories. The struggle against the Hapsburgs continued under Henry II, who also became involved in a war with England, which had allied itself with the German powers. During this conflict England was forced to surrender Calais, its last possession in France.

Another struggle began during the reign of Henry II—the struggle between the Catholics and the Protestants, or Huguenots, as they were called in France; and this developed in the succeeding reigns into a series of religious wars which almost rent the country asunder. The climax, but by no means the end, came in the massacre of Saint Bartholomew's Day, which failed in its purpose of utterly quelling the Protestants. Not until the accession in 1589 of Henry of Navarre, leader of the Protestants, as Henry IV, did the religious wars terminate, and even then they were brought to an end only by Henry's acceptance of Roman Catholicism. It was this king, the first of the Bourbons, who published the famous Edict of Nantes, giving full religious liberty to the Huguenots, and turning over to them several cities, including La Rochelle. By reason of his wise policies and the progress which the kingdom made under him he well merited the title of "the Great" and his assassination in 1610 was regarded as a national calamity.

The Age of Absolutism. Through the reigns that follow there is plainly visible the growth of that absolutism, that oppression which toward the end of the eighteenth century brought on its own punishment in the French Revolution. Richelieu stripped the nobles of all power, and as the general assembly had lost practically all of its constitutional rights and was little more than a court of law, the king, or his chosen minister with him, was an uncontrolled despot. Richelieu, Mazarin, Louis XIV—these are names which stand in the world's history for absolutism. Never in all its history was France more glorious outwardly than during the early years of Louis's reign. Successful in war, dominant at home, the king surrounded himself with all the elegance and glitter which a subservient people liked to see about their king; he has come down in history as the "Grand Monarch." But matters changed, Louis's armies failed, and the people, oppressed under unendurable burdens of taxation, began openly to express their discontent. The reign of Louis XV was but a period of further depression and decay—costly wars, heavy taxes and a king and ministers for whom not the least respect could be felt. Louis XVI, who came to the throne in 1774, found matters in a desperate state. A stronger king might have mended affairs somewhat, but Louis's mild measures had no power to lessen the tyranny which the privileged classes exercised over the lower orders, or to cleanse a society rotten to the core. The financial condition of the country was hopeless, and the successive ministers attempted in vain to grapple with it.

Finally, in despair, one of them, Necker, counseled an extreme measure—no less than the calling together of the States-General, or parliament, which had not been summoned since 1614. In 1789 this body met, and with it began that violent movement, one of the most remarkable the world has ever witnessed, known as the French Revolution. The history of the next ten years is treated under that title (see FRENCH REVOLUTION), while that for the fifteen years following is included in the article on NAPOLEON I.

Reaction and New Discontent. It was said of the Bourbons that "they never forgot anything and never learned anything," and the truth of this was proved by Louis XVIII, who came to the throne on the downfall of Napoleon in 1814 (see BOURBONS), for he promptly turned from the moderate liberals, with whose support he had begun to govern, to the reactionaries, and tried to practice the same oppressive measures which had brought on the Revolution. His brother, Charles X, succeeded him in 1824, and proved even less liberal; and in 1830, when his ministry published ordinances curtailing the liberty of the press and lessening the elective privileges, an insurrection broke out by which Charles was overthrown and Louis Philippe was placed on the throne, as "king of the French." The *bourgeois*, or "middle class," king he was called, and for a time his rule was fairly popular, but he proved no more ready than his predecessors to grant liberties to the people, while in international affairs he took a decidedly subordinate place. In 1848, therefore, another revolutionary outbreak drove him into exile, and later in the year a republic was proclaimed. The first President elected was Louis Napoleon, nephew of the great Emperor—a man whose ambitions were by no means satisfied with being the head of a mere republic. He desired imperial

sway, and in 1852 he was able, by a sudden seizure of power, to have himself proclaimed emperor. Millions of votes confirmed his move, and the Second Empire was launched. For the events of the period see NAPOLEON III.

The growth of the Prussian power was watched by the French and especially by the emperor with increasing uneasiness, which reached its climax in 1870 when the vacant throne of Spain was offered to a Hohenzollern (German) prince. The demands which France made at this time so incensed Germany that war succeeded (see FRANCO-GERMAN WAR), the results of which might have been foreseen.

Germany had been preparing for just such a struggle for years, while the resources of France, on the other hand, were at a low ebb; and in a comparatively short time France suffered a complete and intensely humiliating defeat. Germany demanded so great an indemnity that it felt assured France would be crushed for a half century, but the Germans were paid within ten years. Alsace and Lorraine were also demanded by Germany, and the French never forgot this seizure (see ALSACE-LORRAINE).

Immediately on receipt of the news of the defeat of Sedan, Napoleon III was deposed and France was declared a republic.

The Third Republic. After a period of civil war and of humiliation, during which the German troops occupied Paris, a stable government was established, and Thiers was chosen President. He resigned in 1873 and Marshal MacMahon succeeded him, and two years later the present constitution of France was adopted. MacMahon resigned in 1879, and Jules Grévy was chosen his successor. Two years later France adopted its active colonial policy, first Tunis and then Madagascar being reduced to the rank of dependencies, or colonies, and this policy of expansion was pushed in the Far East, in Indo-China.

Reëlected in 1885, Grévy resigned in 1887, and Sadi Carnot became President. During his administration there took place a serious attempt of the radicals, the Orleanists and the Bonapartists, united under General Boulanger, to overthrow the republic. "Marianne," however, as the republic is called half in affection and half in good-natured contempt, was saved by Boulanger's loss of popularity. Carnot's administration also saw another sensation—the failure of the Panama Canal scheme, and the subsequent prosecution of a number of men high in public life (see PANAMA CANAL).

In 1894 Carnot was assassinated by an Italian anarchist, and Casimir-Périer was chosen to fill his place. He resigned in less than a year, and was succeeded by Félix Faure, during whose administration was begun the far-famed Dreyfus case (see DREYFUS, ALFRED), which threatened the very existence of the republic. This was continued under Emile Loubet, who was chosen President on the death of Faure in 1899. His administration was marked by the bill which separated Church and State (see subhead *Religion,* above), by the strengthening of cordial relations with Italy and Russia and by the establishment in 1904 of an English-French agreement which brought the two nations into closer touch than they had been in years.

Loubet was succeeded in 1906 by Fallières, and during his administration conflict with Germany seemed imminent because of opposing colonial interests, but Poincaré, the prime minister, was strong enough to avoid the crisis. Poincaré became President in 1913, and soon after he took office it became evident that relations between France and Germany were becoming more and more strained. A law was passed to increase the size of the French army, but before it could be made thoroughly effective the long-looked-for break had come—the War of the Nations had commenced, with an apparent cause quite apart from the interests of France.

The military movements, as well as the other significant features of that Titanic struggle are treated in the article WAR OF THE NATIONS; it remains here but to record a few points which relate especially to France. Most evident from the first was the loyalty of all classes to the government. Socialists, whose opposition to war had been feared; royalists, who had been looked upon as enemies of the republic, all responded eagerly to the call for troops. Even the priests, who had been rendered hostile by the withdrawal of state aid from the Church, showed a conspicuous loyalty, and thousands of priests joined the colors. It was tacitly assumed that Alsace and Lorraine were again to become French, in event of victory over the Teutonic powers, for France had never lost sight of that ambition since the Franco-German struggle almost half a century earlier; but only the outcome of the war can decide that important question with any certainty. J.A.A.J.

Consult Vizetelly's *Republican France: Her Presidents, Statesmen and Policy;* Poincaré's

OUTLINE AND QUESTIONS ON FRANCE

Outline

I. Location

(1) Latitude, 42° 20′ to 51° 5′ north
(2) Longitude, 4° 48′ west to 7° 31′ east
(3) Relation to other European countries
(4) Practical isolation

II. Size

(1) Actual, 207,128 square miles
(2) Comparative

III. Physical Characteristics

(1) Seacoast
  (a) Length
  (b) Character
  (c) Harbors
(2) Surface
  (a) Northern and western plain
    1. Average height
    2. Features of interest
  (b) South-central plateau
    1. Cevennes
  (c) The southern highland
    1. The scenic region
    2. Greatest altitude—Mont Blanc
  (d) The Pyrenees
(3) Rivers
  (a) Rhone
  (b) Garonne
  (c) Loire
  (d) Seine
  (e) Smaller rivers

IV. Climate

(1) General mildness
  (a) Effects of sea and mountains
  (b) Average temperatures
(2) Winds
(3) Rainfall

V. Industries

(1) The main industry—agriculture
  (a) Most productive regions
  (b) Productive methods
  (c) Chief crops
    1. Wheat
    2. Grapes
    3. Sugar beets
  (d) Stock-growing
(2) Mining
  (a) The "staple" minerals
    1. Coal and iron produced, but not in sufficient quantities
  (b) Minor importance of other minerals
(3) Manufacturing
  (a) Superior skill of French workmen
  (b) Chief products
(4) Fisheries

VI. Transportation and Commerce

(1) Railroads
  (a) Mileage
  (b) Excellence of service
  (c) Government control
(2) Canals and rivers
(3) Roads
(4) Foreign commerce
  (a) Exports
  (b) Imports

VII. The People

(1) National characteristics
(2) Racial elements
(3) Population
(4) Density compared with that of other countries
(5) Slow growth of population

VIII. Education and Religion

(1) Excellent school system
(2) Higher education
(3) Predominance of Roman Catholicism
  (a) Disestablishment of state Church

IX. Government

(1) Republican in form
(2) The departments
(3) Local government
(4) Government of colonies and protectorates

X. History

(1) The "Gaul" of the Romans
(2) The coming of the Franks
(3) The strong Carolingian kings
  (a) Charlemagne
(4) The beginnings of the real France
  (a) The Capetians
(5) The Hundred Years' War
  (a) Joan of Arc
(6) The growth of the royal power
(7) The religious wars
  (a) Massacre of Saint Bartholomew's Day
(8) Growing absolutism
(9) The French Revolution
  (a) Causes
  (b) Events
  (c) Results
(10) The Napoleonic era
(11) The restoration and the July revolution of 1830
(12) The republic of 1848
(13) The second empire and the Franco-German War
(14) The third republic
(15) Recent growth
(16) The War of the Nations

Questions

What has been the cause of the very slow increase in the population of France?

How do the Pyrenees differ in general conformation from the Alps?

How many countries have a greater railway mileage than has France?

If a Frenchman commits a crime for which he may be sentenced to not more than five years' imprisonment, by what court is he tried?

How many sovereign queens has France had?

Who was the "Grand Monarch," and why was he so called? What effect did his reign have on the country?

How many countries of Europe have a greater population than France? How many are more densely populated?

What is the tallest peak in France? How does it compare with the tallest in Canada? In England? In the United States?

Is the popular song which refers to the beauties of "Apple-blossom time in Normandy" true to the facts in the case?

What may the Chamber of Deputies do which the Senate may not?

Why does the Battle of Tours rank among the fifteen decisive battles of the world?

What did France ever have to do with the Panama Canal?

What general difference is noticeable between the people of Northern France and those of the southern regions, and how is this accounted for by their origin?

If the ocean should rise 660 feet, what would constitute the seacoast of France?

Why do not the peasants of France eat as much rye bread as do those of some other countries?

What little insect has cost France millions of dollars?

How many Presidents have served two full terms? How does this compare with the number in the United States?

How did the Germanic method of inheritance differ from the Roman?

What was the last territory that England held in France? When was it lost?

How many republics have there been in France?

Characterize briefly the people of France.

Why do French farms produce more per acre than those of some other European countries?

Why are the high mountain valleys the best places for manufacturing concerns?

What effect did the policies of Louis XI have on the history of the country?

Why was the outcome of the Franco-German War a foregone conclusion?

How far could you travel in a straight line in France?

In olden times, what geographical advantage did France share with Italy and Greece?

How would a range of mountains near the west coast alter rainfall conditions?

Who was the great crusading king of France?

Of whom was it said that "they never forgot anything and never learned anything"?

Why is France almost as completely isolated as is Great Britain?

How do the imports of the country differ in general character from the exports?

What girl gave back to a king his kingdom?

What is the national flower of France?

How has the cutting down of forests injured the country?

Who was on the throne when the great Revolution broke out? In what measure was he to blame for it?

How France is Governed; Lilly's *The New France;* Lebon's *Modern France,* in "Story of the Nations" Series.

Related Subjects. The following articles in these volumes will give detailed information on many phases of the geography and life of France:

CITIES AND TOWNS

Agincourt
Aix
Alençon
Amiens
Bordeaux
Brest
Caen
Calais
Cherbourg
Cluny
Crécy
Dijon
Dunkirk
Fontainebleau
Grenoble
Havre
Le Mans
Lille
Limoges
Lyons
Marseilles
Montpellier
Nancy
Nantes
Nice
Nimes
Orleans
Paris
Poitiers
Rennes
Rheims
Roubaix
Rouen
Saint Denis
Saint Etienne
Saint Quentin
Sevres
Toulon
Toulouse
Tours
Versailles

COAST WATERS

Atlantic
Biscay
English Channel
Mediterranean

FORMER DIVISIONS

Brittany
Burgundy
Gascony
Normandy

HISTORY

Agincourt
Aix-la-Chapelle
Albigenses
Alsace-Lorraine
Bastille
Bonaparte
Bourbon
Capetian Dynasty
Carolingians
Chivalry
Commune of Paris
Continental System
Crécy
Crimea, subhead *Crimean War*
Crusades
Directory
Emigrés
Feudal System
Field of the Cloth of Gold
Franco-German War
Franks
French and Indian Wars
French Revolution
Fronde
Gaul
Girondists
Guise
Huguenots
Hundred Years' War
Jacobins
July Revolution
Leipzig, Battles of
Liberty Cap
Louisburg, Sieges of
Merovingians
Mississippi Scheme
Nantes, Edict of
Normans
Orleans
Paris, Treaties of
Parlement
Powers, The Great
Quebec, Battle of
Reformation
Renaissance
Saint Bartholomew's Day, Massacre of
Salic Law
Sedan, Battle of
States-General
Succession Wars
Trafalgar
Triple Alliance
Triple Entente
Valois
Verdun, Treaty of
Vienna, Congress of
Waldenses
War of the Nations
Waterloo, Battle of
Westphalia, subhead *Peace of Westphalia*
X Y Z Correspondence

Much of the history of the country is contained in the articles on the following persons of note. The kings are not indexed here because they are listed in the article above.

Barras, Count de
Bayard, Chevalier de
Carnot, Marie François Sadi
Charles Martel
Danton, Georges Jacques
Delcassé, Théophile
Dreyfus, Alfred
Eugene, François
Fallières, Clement Armand
Frontenac, Comte de
Gambetta, Leon
Genet, Edmon Charles Edouard
Godfrey de Bouillon
Grévy, Jules
Guizot, François P. G.
Joan of Arc
Joffre, Joseph Jacques Césaire
Lafayette, Marquis de
Lamartine, Alphonse de
Loubet, Emile
MacMahon, Maurice de
Marat, Jean Paul
Mazarin, Jules
Mirabeau, Count de
Montcalm de Saint-Veran, Marquis de
Murat, Joachim
Necker, Jacques
Ney, Michel
Poincaré, Raymond
Ribot, Alexandre Felix Joseph
Richelieu, Duke de
Robespierre, Maximilien
Rochambeau, Count de
Saint-Cyr, Laurent Gouvion
Saint Just, Antoine
Sieyès, Emmanuel Joseph
Talleyrand-Perigord, Duke de
Thiers, Louis Adolphe
Tocqueville, Alexis de
Waldeck-Rousseau, Pierre

LEADING PRODUCTS

Beet
Chestnut
Cider
Coal
Fish
Grape
Iron
Lace
Silk
Textiles
Wheat
Wine

MOUNTAINS

Alps
Cevennes
Jura
Mont Blanc
Pyrenees
Vosges

RIVERS

Aisne
Garonne
Loire
Marne
Meuse
Moselle
Rhone
Saône
Seine
Somme

UNCLASSIFIED

Champs Elysées
Corsica
Department
Gris-nez, Cape
Legion of Honor
Oriflamme
Tuileries

FRANCE, ANATOLE (1844-), the pen name of JACQUES ANATOLE THIBAULT, a French novelist and humorist, and since 1884 a member of the French Academy. Besides *The Crime of Sylvester Bonnard,* which established his fame, his works include *The Red Lily, Thais, The Garden of Epicurus* and his latest romance, *The Revolt of the Angels,* which deals with the adventures of Lucifer (which see) after his banishment from heaven. He is one of the most popular present-day writers.

FRANCHISE, *fran'chize,* a particular privilege of a public nature granted by the government of a state or city to individuals, associations or corporations, which does not belong to the citizens generally as a common right. A franchise may grant the right to a special use of public property, such as streets for electric cars, or the right to take needed private property, with compensation. All public service companies which are granted franchises must render service to all persons desiring it, on equal terms, without discrimination and for reasonable compensation. If this were not so, companies existing by the grant of public franchises, engaged in supplying the great conveniences of life, such as water, gas, electric lights, street cars, etc., could impose hardships upon the public. A franchise or corporation will not be allowed to allege as an excuse for failure to perform any duty required of it that it would be unprofitable. It cannot keep its franchise and refuse to perform its duties.

Each state or province decrees by statute the general terms upon which franchises may be granted, then local bodies, such as city boards of aldermen or county commissioners, issue the necessary permits. In years not long past it was customary to grant franchises for terms of fifty or seventy-five years, or even in perpetuity. People of to-day have learned that the best means of securing from public service corporations acceptable service is to grant privileges for no longer than twenty to thirty years. When a company must seek frequent renewal of its privileges it is quite likely to render the best possible service. Frequently in return for the privileges granted it, the company is made to pay to the municipality a portion of its net earnings.

FRAN'CIS, the name borne by two of the French kings near the beginning of the period of modern history.

Francis I (1494-1547) came to the throne in 1515 on the death of his father-in-law, Louis XII. During the greater part of his reign he was engaged in a bitter struggle with Emperor Charles V of Germany, whose election to the imperial dignity (see Holy Roman Empire) had been a source of great disappointment to the French king. Before beginning the war Francis invited Henry VIII of England to a conference, hoping to secure the latter as an ally, and the two kings, each attended by a magnificent train of nobles, met in 1520 on the famous Field of the Cloth of Gold (which see).

The conflict between Francis and Charles, which began in 1521 and ended with the Treaty of Crespy in 1544, resulted in no decisive advantage to either side. Its most striking features were the crushing defeat of Francis at Pavia, Italy, in 1525, where he was taken prisoner, the sack of Rome by an imperial army in 1527, and the French king's alliance with the sultan of Turkey. The most commendable feature of his reign was his patronage of art and learning.

Francis II (1544-1560), son of Henry II and Catharine de' Medici (which see), came to the throne in 1559. During his short reign of one year the government was in the hands of the uncles of his wife, who was Mary Queen of Scots. He was succeeded by his brother, Charles IX.

FRANCIS, the name of two sovereigns who have borne the title Holy Roman Emperor (see Holy Roman Empire).

Francis I (1708-1765) was crowned Holy Roman Emperor in 1745, nine years after his marriage to Maria Theresa of Austria, the only daughter and heiress of Emperor Charles VI (see Maria Theresa). On the death of Charles, in 1740, Maria named her husband coregent with herself, but she kept in her own hands the actual management of the kingdom. To Maria also fell the burden of carrying on the Seven Years' War (which see), which broke out between Austria and Prussia in 1756. Joseph, son of Francis and Maria, succeeded his father as Holy Roman Emperor in 1765.

Francis II (1768-1835) was the last ruler to bear the title Holy Roman Emperor. He succeeded to the hereditary dominions of Austria in 1792, and later in the same year was elected Holy Roman Emperor. At this time Prussia and Austria were leagued together against the new republic of France, born of the French Revolution, and hostilities were continued until 1797, when, by the Treaty of Campo Formio, Francis was forced to cede Belgium and Lombardy to France. Two years later he entered into an alliance with Russia and England, hoping to check the ambitious designs of Napoleon, but the new war was most disastrous for Austria.

In 1804 Francis assumed the title "Emperor of Austria," and the following year made another alliance with Russia. The combined Russian and Austrian armies were hopelessly defeated by Napoleon at Austerlitz (1805), and the Holy Roman Empire, after an existence

of a thousand years, was dissolved. In 1806 Francis gave up his imperial title, being known thereafter as emperor of Austria.

He joined another league of the powers against Napoleon in 1814, and after the latter's downfall associated himself with Alexander I of Russia and Frederick William III of Prussia in the formation of the Holy Alliance (which see). During the remainder of his reign he ruled as an absolute monarch.

FRANCISCANS, *fran sis' kanz,* members of three great religious Orders, founded in the thirteenth century by Saint Francis of Assisi. The first Order is that of the *Friars Minor,* or gray friars; the second, that of the *Poor Clares,* or Franciscan nuns; and the third, the *Order of Penance* or *Tertiaries.* While their original aim was the spiritual welfare of the masses, the Franciscans soon became identified with great educational institutions. They are intimately associated with the mission work of the United States and Canada, where, notably along the Pacific coast, they labor nobly for the education and uplift of the Indians. See FRANCIS OF ASSISI.

FRANCIS JOSEPH I (1830-1916), emperor of Austria and king of Hungary, had one of the longest reigns in history. He became emperor in the revolution year of 1848, on the abdication of Ferdinand I, and succeeded to a troubled empire. Hungary openly revolted, even going so far as to declare a republic, but the young emperor succeeded in putting down the rebellion and establishing nearly absolute authority. The Hungarians did not placidly submit to having their liberties taken from them, and in 1853 a Hungarian almost succeeded in assassinating Francis Joseph.

FRANCIS JOSEPH

All the policies of the government were at first thoroughly reactionary, and the insurgents in Italy were put down as vigorously as those in Hungary had been. In 1859 a war broke out with Sardinia, and though France deserted Sardinia in the midst of the struggle, the result was the loss to Austria of Lombardy. The question of the supremacy of Austria or Prussia in Germany led to the Seven Weeks' War, which ended disastrously for Austria, and after the close of that struggle Francis Joseph adopted more liberal policies. Constitutional rights were granted, and the Austro-Hungarian state as it exists to-day was formed, the emperor being crowned king of Hungary in 1867.

Francis Joseph always enjoyed a very considerable popularity, and this, rather than any real spirit of union, held his dual realm together. During his reign industrial conditions greatly improved, and the country made far more progress than ever before. The life of the emperor was saddened repeatedly by tragedies which stirred the nation and the world. In 1898 his empress, Elizabeth, whom he had married in 1854, was assassinated by an Italian anarchist; in 1889 his only son was killed, which left a nephew, Archduke Francis Ferdinand, as heir to the throne. In June, 1914, Francis Ferdinand and his consort were murdered in their carriage, in Serajevo, Bosnia, by a Serbian, a tragic incident which hastened the War of the Nations two months later. These events accentuated the troubled political condition in the realm of Francis Joseph and denominated him the "monarch of many sorrows." He was succeeded November 21, 1916, by his nephew, who assumed the title Charles I. See AUSTRIA-HUNGARY, subhead *History.*

FRANCIS OF ASSISI, *ah se' ze* (1182-1226), an Italian monk and founder of the religious Order of the Franciscans. In youth his ardent piety prompted him to dispose of his worldly belongings and to devote himself to the service of the poor and afflicted. As his followers increased he journeyed to Rome to obtain the Papal permission to found a religious Order. This was granted after some opposition, and the friars began to increase in number and to spread everywhere. The rule of the Order was based upon the strictest poverty, which implied no property, and existence by means of alms. The simple, austere life of Saint Francis, particularly his deep love for all created things, inspired many non-Catholic movements to honor his memory. One of these was organized by Paul Sabatier, a French Calvinist minister, its object being to study the life and virtues of the saint. See FRANCISCANS.

FRANCKE, *frahnk' e,* AUGUST HERMANN (1663-1727), a German educator, founder of the Francke Institutes at Halle, whose methods and theories have permanently influenced the Prussian system of public education. He was born in Lübeck and educated at the uni-

versities of Erfurt, Kiel and Leipzig. In 1691 he was appointed professor of Greek and Oriental languages at the University of Halle, and at the same time began his duties as pastor of a suburban church. Four years later he established a free school for the children of his parish, the beginning of an educational work of far-reaching importance. From this small beginning developed an elementary school for the children of the citizens of Halle, an orphan asylum, a boarding school for well-to-do boys, a training school for teachers and a Latin school. Many notable educational leaders went out from his institutions, and his methods were followed in various parts of Europe. At the present time the Francke Institutes form in themselves almost a suburb of the city of Halle, and are given government support.

FRANCO-GERMAN WAR, a momentous struggle which took place between Germany and France in 1870-1871. By its overthrow of Austria in the Seven Weeks' War Prussia had placed itself at the head of the German states, and this position it was determined to maintain. Napoleon III of France recognized the fact that nothing would so strengthen his government as a successful foreign policy, and particularly a defeat of Prussia, the ancient enemy of France. Meanwhile Bismarck, the great German statesman, was equally anxious for a struggle. A cause was not far to seek, and was found in a question as to the succession to the Spanish crown, which had been offered by Marshal Prim to Prince Leopold of Hohenzollern, a German. It was felt in France that this would increase the power of Prussia beyond safe limits, and although Leopold voluntarily withdrew his name, the French government demanded of Prussia a promise that no Prussian prince should ever sit upon the Spanish throne. Naturally Prussia refused to comply with this demand, and the result was a declaration of war on the part of France.

Both countries went into the struggle with great enthusiasm. In Prussia, where the probability of such a war had long been foreseen, the army was in a state of readiness, and plans had been carefully made by the military genius, Von Moltke. In France, on the contrary, no one seemed to have a correct measure of the forces that might be drawn upon, and they proved vastly inferior in numbers and in organization to what had been hoped. Only about 250,000 men were found to be available, as against 450,000 Germans, who had also a reserve of almost 400,000. The victory was with the Germans from the first. At Weissenburg, at Wörth and at Spichern the French armies were defeated, and their numbers were greatly lessened. At length the forces divided into two parts—one under MacMahon and one under Bazaine; and these two were separated by the Germans and prevented from effecting a junction. Bazaine was defeated and surrounded at Metz, and thus kept from giving any aid to France. MacMahon, ordered to march to the relief of Bazaine, met the Germans near Sedan, and there was fought a great battle which resulted in the total defeat of the French and the surrender of the whole army, with Napoleon (September, 1870). In October of the same year Bazaine was forced to surrender at Metz.

When the news of the defeat at Sedan reached Paris, Napoleon was deposed and France was declared a republic. The first task of the new government was to put Paris in condition to withstand a siege. Despite the heroism of the inhabitants, however, and the utmost efforts of the French army, the siege was continued only until February, 1871, when the city was forced to yield. A treaty was drawn up, in accordance with which France gave up Alsace and the German-speaking part of Lorraine and pledged itself to pay a war indemnity amounting to about one billion dollars. This war, which proved the total overthrow of the second empire in France, greatly strengthened the plans for German unity by bringing the various German states together against one enemy. See subtitle *History,* under FRANCE and GERMANY. A.MC C.

Consult Maurice's *Franco-German War,* in "Cambridge Modern History" Series; Hertslet's *The Map of Europe by Treaty.*

FRANCOLIN, *frang' ko lin,* a game bird related to the partridge. There are forty or more species, most of which are found in Africa. The coloration of all is rich and varied, and the plumage of the sexes is practically alike; in this francolins differ from most other birds. They travel in family parties, rather than in coveys, and fly swiftly and heavily. They feed in the morning and at evening, at which times their

THE FRANCOLIN

loud, shrill cries may be heard in all directions. Their diet consists of insects, berries, seeds and bulbs. Their nests are well concealed and resemble those of the partridges. Six to fourteen eggs are laid in the autumn and spring; these are brown and buff in color, with small, dark spots. Francolins once abounded in Southern Europe, but are now extinct there.

FRANKFORT, IND., the county seat of Clinton County, is situated north and west of the center of the state, twenty-four miles southeast of Lafayette and forty-seven miles northwest of Indianapolis. It is on Prairie Creek and on the Vandalia; the Lake Erie & Western; the Toledo, Saint Louis & Western (Clover Leaf), and the Chicago, Indianapolis & Louisville railroads. It has two interurban lines, one extending to Lafayette, the other to Indianapolis. The area of the city is about three square miles. The population in 1910 was 8,634; in 1916 it was 9,596, by Federal estimate.

Among the more prominent structures are a $200,000 courthouse; a Federal building, erected in 1914 at a cost of $80,000; the home office of the People's Life Insurance Company; an opera house, Masonic Temple, Elks Home and a Carnegie Library. The public park of eighty-three acres contains a golf course, baseball grounds, tennis court, zoo, swimming pool and playground equipment.

The city contains a number of large grain elevators, and is an important grain market. The wholesale business amounts to nearly $1,500,000 annually. Among a number of wholesale houses are those handling meat, fruit and vegetables, poultry, confectionery and barber supplies. Broom and handle factories, planing and saw mills, two electrically-equipped flour mills, a large creamery plant with an annual output of 2,700,000 pounds of butter, a kitchen cabinet factory, stove and furnace and canning factories and an artificial ice and refrigeration plant are the important commercial enterprises. The Clover Leaf railroad shops are located here. Frankfort was founded in 1830 and chartered as a city in 1875. F.R.

FRANK'FORT, KY., the state capital and the county seat of Franklin County, is twenty-nine miles northwest of Lexington, fifty-five miles east of Louisville and ninety-three miles south of Cincinnati. It is on the Kentucky River, and on the Louisville & Nashville, the Chesapeake & Ohio and the Frankfort & Cincinnati railroads. It is also served by an interurban line, and there is steamboat communication with Cincinnati, Louisville and other river ports. The area of the city is nearly ten square miles. The population was 10,465 in 1910, and 11,080 in 1916, by a Federal estimate.

Special Features. Frankfort is built upon low rolling hills on both sides of the river, which is crossed by a suspension bridge 700 feet long. The surrounding country is the famous Blue Grass region of Kentucky. The city contains a number of beautiful buildings, the most prominent of which is the new Capitol, erected at a cost of $2,000,000. It is constructed of granite and white limestone, in the Italian Renaissance style. In it are housed the state library and the library of the Kentucky State Historical Society, in whose rooms are some valuable works of art. The old Capitol, first occupied in 1829, is still standing, and is a noteworthy specimen of early American architecture. Other prominent structures are the Federal building, erected in 1883 at a cost of $180,000, and recently enlarged at a cost of $125,000; the governor's mansion, state arsenal, Y. M. C. A. and public library. Here also are located a state normal for colored people, the state home for feeble-minded children and the state penitentiary. Glenwood Park and the grounds surrounding the new Capitol together contain about sixty acres.

Franklin (state) Cemetery, beautifully situated on a hill near the city, is an interesting historical burying ground. In it lie the remains of Daniel Boone and his wife, Vice-President Richard M. Johnson, the sculptor Joel T. Hart, the poet Theodore O'Hara, who wrote *The Bivouac of the Dead,* twelve governors of Kentucky, nine United States Senators, four ministers to foreign countries and three United States district judges.

Industries. The varied industries of Frankfort include manufactures of lumber, flour, shoes, chairs, tobacco, twine, whisky, brooms and other commodities. There are canning factories and two reel factories. Water power is furnished by a lock and dam across the river. Hemp and tobacco are extensively raised about Frankfort, and the city has a large wholesale trade in these and other products.

History. Frankfort was founded in 1786 by General James Wilkinson, who made the settlement the base of his trading operations and intrigues with the Spanish at New Orleans. It became the state capital in 1792. J.O.L.

FRANKFORT-ON-THE-MAIN, a German commercial city, the birthplace of Goethe, the nation's most distinguished poet; Feuerbach, the philosopher; Schlosser, the historian; Kirchner, the scholar and naturalist, and many other celebrated men. The city is situated in the Prussian province of Hesse-Nassau, on the right bank of the River Main. Frankfort was long the place of election of the German emperors. In the election room of the Rathaus, or Römer, a Gothic structure dating back to the fifteenth century, electors have had many historical meetings, while in its Kaisersaal, or imperial hall, many newly-elected emperors have held public banquets. From the thirteenth to the sixteenth century, the coronation took place in the Cathedral of Saint Bartholomew, one of the city's most remarkable churches.

In recent years Frankfort has been greatly extended and improved, and many fine public and private buildings have been erected; among them are the new opera house, one of the finest in the world; the courts of justice, and the new exchange. The city lies at the junction of seven railways, and it has direct ocean communication by way of the Main and the Rhine. It is one of the most famous banking centers of Europe. Although insignificant compared with its commercial activities, the city's leading manufactures include colonial wares, machinery, soap, perfumery and hats.

Frankfort is rich in associations of literature and art, as well as in establishments to promote them. Notable among the latter are the Historical Museum, the Städel Art Institute and the Rothschild Library. In the public squares are fine statues of Goethe, Schiller and Gutenberg. The city dates from the time of Charlemagne. After Napoleon's downfall it became a free city—one of the four in Germany. However, in 1866, having espoused the unsuccessful Austrian cause in the Seven Weeks' War, it was seized by the Prussians and later formally incorporated with Prussia. Population in 1910, 414,576.

FRANKFORT-ON-THE-ODER, an important commercial town, carrying on an extensive trade both by land and water, is a town of Prussia, in the province of Brandenburg, fifty-one miles southeast of Berlin. Three great fairs are held here annually. The town, which is well built, has many iron foundries, tanneries, and breweries; its chief manufactures consist of machinery and metal goods, chemicals, organs, leather, stoneware, tobacco, spirits and paper. The university, founded in 1506, was incorporated with that of Breslau in 1811. Among its chief buildings are the Church of Saint Mary, the Rathaus and a theater. The Oder is a navigable river, and, because of its connection by canals with the Vistula and the Elbe, Frankfort-on-the-Oder has always enjoyed considerable commercial importance. Population in 1910, 68,230.

FRANK'ING PRIV'ILEGE, the right to send letters and packages through the mail without charge. In Great Britain the privilege was abolished by Parliament in 1840, excepting for official documents. The same rule applies to Canada.

In the United States it was first accorded to soldiers in actual service during the Revolutionary War; then to officers of the government, Senators and Representatives in Congress, postmasters for official correspondence, newspaper exchanges and petitions to Congress, and later, exchanges of the Smithsonian Institute and medals and testimonials to soldiers. The first four Presidents were accorded the franking privilege for life, and it was granted to the widows of ex-Presidents Garfield, Cleveland and Harrison by Congressional vote.

The privilege was entirely abolished in 1873 in the United States, but was partially restored later. The President, Vice-President, Senators, Representatives and Delegates in Congress, Secretary of the Senate and Clerk of the House of Representatives may send and receive free through the mail all public documents printed by order of Congress. Official business of each executive department or bureau of the government is always franked. Seeds may be transmitted by the Department of Agriculture; any member of Congress receiving seeds from the Department for distribution may mail them free. All official correspondence of the Superintendent of Documents is entitled to free transportation, and he is entitled to frank public documents. Envelopes for franking mail are marked *Official Business.*

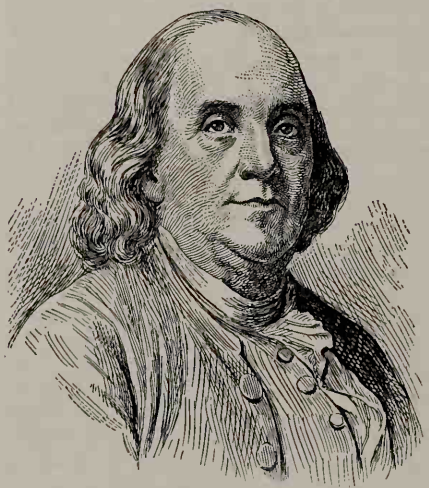
The franking privilege has been greatly abused at times. In theory it is excellent, for public documents of an instructive nature should reach interested persons without expense. However, there have been instances of mailing half a million copies of Congressmen's speeches simply as arguments in the heat of a political campaign, against which practice much objection is made. The fine for franking private mail matter is $300.

FRANKLAND, or **FRANKLIN,** a name given in 1784 to a short-lived state organization, of which John Sevier, a notable man at the time, was governor. It was formed as a protest against the action of North Carolina in depriving its citizens of state government. At the close of the Revolutionary War Congress had no money to pay its debts, and asked all the states holding Western lands to donate them to the Federal government. North Carolina, of which the present Tennessee was then a part, agreed, but the settlers of this latter region did not give the plan their approval, and they set up a new state which they named Frankland, or Franklin. They fixed the salaries of their officers at so many raccoon skins, because of the scarcity of money. After a hard struggle, North Carolina suppressed the new government in 1788. The territory of Tennessee was ceded to the United States government in 1790, and in 1796 it was admitted as the sixteenth state of the Union. See TENNESSEE, subhead *History.*

FRANK'LIN, a district of the Northwest Territories of Canada, named in honor of Sir John Franklin. It was formed in 1895, and includes many islands to the north of the mainland, as well as Baffin Land and Albert Land. It is practically uninhabited, for it is almost entirely within the Arctic Circle; the only inhabitants are a few Eskimos in Baffin Land. The total area is estimated at 500,000 square miles. In some parts of the district musk-oxen, bears, foxes and other fur-bearing animals are found in large numbers. For further details, see NORTHWEST TERRITORIES.

FRANKLIN, BENJAMIN (1706-1790), one of the first great Americans and, what can be said of few men in all the world's history, a man distinguished in almost every field of endeavor. The epigrammatic inscription carved on a medallion of him, "He has seized the lightning from Heaven and the sceptre from tyrants," mentions but two of the numerous phases of his activity. Scientist, author, statesman, philosopher, inventor, printer, diplomat, humorist—surely few other men ever ventured on so many careers and worked them out so successfully. "America's patron saint of common sense," he is called, and the description fits him well; for in everything he did, in everything he said and in everything he wrote there was evidence of plain, unsentimental, common sense.

Early Life. Benjamin Franklin was born on January 17, 1706, in Boston, where his father was a tallow chandler. As the family was poor and as Benjamin was the fifteenth of seventeen children, he had no special advantages and went to school less than a year. He disliked the work in his father's shop and was therefore apprenticed to an older son, who was a printer, though it had been the family's intention to devote this tenth son as its "tithe for the ministry." In his brother's office Franklin mastered his new trade, and found



BENJAMIN FRANKLIN

He was the characteristic figure of the age in which he lived; yet we to-day find him as modern as ourselves.

time to read much, and thoughtfully. Books were not numerous, but *Pilgrim's Progress,* Plutarch's *Lives* and an old volume of the *Spectator* with Addison's matchless essays never lost their charm for him.

That he was forming an English style as well as entertaining himself was soon evident from the little essays which began to appear in his brother's paper, the *New England Courant.* These Franklin had slipped under the office door, and the brother was well pleased to print them, but when he learned who their author was he refused to publish more and soundly scolded the daring youth. Indeed, friction between the two brothers was constant, and finally, in 1723, the younger ran away to Philadelphia. Most people, even those who have not read the rest of Franklin's autobiography, are familiar with his account of his first day in Philadelphia. Having spent his last money for three "great puffy rolls," he walked down the street eating one and carry-

ing the others under his arm, while a young girl, whom fortune destined to be his future wife, stood in a doorway and laughed at him.

Beginnings of Success. Franklin's knowledge of printing soon secured him work, and so able did he prove to be that in the next year Sir William Keith, the governor of the colony, sent him to England to buy a printing outfit. Keith did not live up to his promises, however, and Franklin worked for a year and a half in London, acquiring new skill. Shortly after his return to Philadelphia he found a partner who had money, so he opened a printing shop for himself, and in 1729 bought the *Pennsylvania Gazette,* which he edited and printed so ably that he became known through all the colonies. His public life had now begun, and his influence became stronger and stronger, especially on the questions of frugality, industry and temperance. *Poor Richard's Almanac,* which appeared yearly from 1732 to 1757, carried into thousands of homes his practical wisdom and made his quaint, pithy sayings part of the national speech. On every tongue were to be heard such of his proverbs as "God helps them that help themselves"; "Never leave that till to-morrow which you can do to-day"; "Silks and satins put out the kitchen fire"; "Lying rides upon debt's back"; "'Tis hard for an empty bag to stand upright." It is difficult to estimate the actual effect which they had in promoting thrift.

WHEN HE ENTERED PHILADELPHIA
A statue of Franklin, at the age of seventeen, modeled by McKenzie.

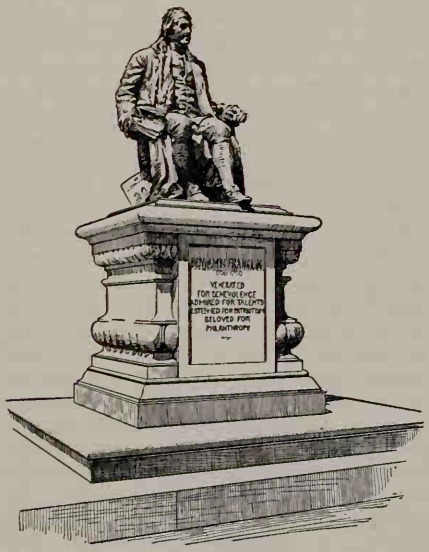
Public Services. But Franklin's part in American life did not consist merely in preaching; he performed momentous services, as well. In Philadelphia he founded the first American public library and a magazine, initiated the postal service, fire companies and a police system, and introduced so many improvements that the city stood as the metropolis of the colonies. Politically, too, he was active. Beginning in 1736 as clerk of the Pennsylvania Assembly, he rose steadily, serving as postmaster of Philadelphia, as a member of the Assembly, and in 1753 as postmaster-general of the colonies. In 1754, in the Albany Convention, he brought forward a plan for colonial union, but neither the colonies nor the mother country favored it, and it was rejected. He did not fight during the French and Indian War, but he did something just as important —guaranteed transportation and supplies to Braddock's forces, and paid for such out of his own funds, which by this time amounted to a considerable fortune.

From 1757 to 1775 he spent most of his time in England, attempting to avert the struggle between that country and the colonies. He detested war; "There never was a good war or a bad peace," he wrote, but when it really came he returned to his home and stood shoulder to shoulder with the other patriots. He was one of the framers and signers of the Declaration of Independence, and it was on the occasion of the signing that he remarked with his quiet humor, "We must all hang together, or assuredly we shall all hang separately." During the war he was sent to France; there his extreme popularity did much to win for the colonies immediate concessions and later a definite treaty of alliance with France. Nothing shows more clearly the esteem in which he was held than the fact that he was the only American to sign the Declaration of Independence, the treaty with France, the Treaty of Paris with which the war closed, and the Constitution of the United States.

Service to Science. It might seem that these activities were enough to demand all of a man's energy and time, but there was another side to Franklin's genius. In 1746 he saw performed in Boston some electrical experiments which interested him greatly, and six years later he proved by an experiment with a kite in a thunderstorm that lightning and electric-

HIS BIRTHPLACE
In Milk Street, Boston.

ity were one and the same thing. Later he invented the lightning rod, the Franklin stove and various scientific appliances. Universities at home and abroad were pleased to confer



THE PHILADELPHIA STATUE

degrees upon him. When he died, April 17, 1790, he was easily the second citizen of the New World—George Washington, alone, towering above him. E.D.F.

Consult his own *Autobiography;* Brooks' *The True Story of Benjamin Franklin;* Ford's *The Many-Sided Franklin.*

FRANKLIN, Sir John (1786-1847), an Arctic explorer, whose journal and scientific records added much to the history of explorations in Arctic lands and among the Eskimos. He died in service in the northland, and the story of his scientific labors was known only when Lieutenant Schwatka discovered the remains of his party in Prince William's Land, thirty years after they were lost. Franklin was born in Lincolnshire, England, and entered the English navy in his youth. After taking part in several expeditions in which he showed his scientific knowledge, he was made lieutenant in 1808, and in 1814 he accompanied the British expedition against New Orleans and was in the battle which was fought after peace was declared. Becoming interested in the exploration of the Arctic coast of North America, he was placed in command of two ships in 1845 to survey the waters and coasts west from Baffin Bay. None of his party ever returned, though nearly forty relief expeditions went in search of him.

FRANKLIN, Pa., the county seat of Venango County, in the northwestern part of the state, nine miles southwest of Oil City, with which it is connected by an electric interurban line. It is on the Allegheny River, and on the Lake Erie, Franklin & Clarion and the New York Central railroads. The city, which has an area of six square miles, has attractive parks and a public library. It is in the richest oil region of the state, and has thriving oil refineries, machine shops and manufactories of oil-well supplies, tools, steel castings and carbon paper. Settled about 1753, Franklin was incorporated in 1795, and in 1913 adopted the commission form of government. In 1910 the population was 9,767; it was 11,307 in 1916, by Federal estimate.

FRANKS, a group of peoples dwelling in the fourth century in what was later France, and north of the Main in what is now Germany, ranging as far as the shores of the North Sea. They were valiant warriors, and were of great stature. Franks killed in battle were buried fully armed; their arms and armor have been found in the ancient cemeteries which abound throughout Northern France.

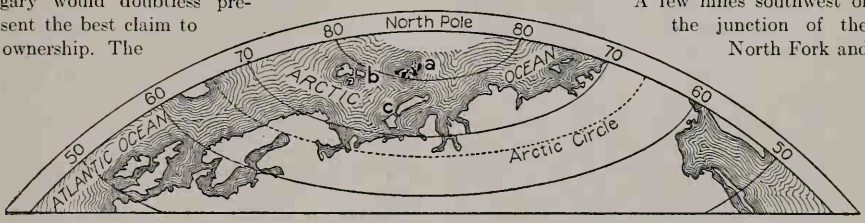
The Franks were distinguished as the *Salians* and the *Ripuarians;* the former lived on the Lower Rhine, the latter on both banks of the Middle Rhine. The Frankish realm attained its greatest dominion under Charlemagne, in 758. The treasures of Rome, polit-

THE FRANKISH DOMINIONS
In A. D. 575.

ical, social and ecclesiastical, were given to the world through the exertions of the Franks. Roman law, literature and the Christian religion were forced on the barbarians by them.

Frankfort-on-the-Main was founded by them in the fifth century; it became the capital of the Eastern Franks in 843, and Charlemagne built his palace there.

FRANZ JO'SEF LAND, a group of about 100 small, uninhabited islands in the Arctic regions, north of Nova Zembla. They are not politically attached to any country, but the flags of different nations have at different times been raised there by exploring parties. They were discovered in 1873 by an Austro-Hungarian expedition and named after the emperor of Austria; were they of value Austria-Hungary would doubtless present the best claim to ownership. The islands are much broken up by bays, straits and fiords, and more than nine-tenths of the land is perpetually covered with ice. Here and there appear bare patches on which moss, lichens and a few Arctic flowers grow.



FRANZ JOSEF LAND

In the map (*a*) is Franz Josef Land. To aid in locating these islands: (*b*) is Spitzbergen, to the west, and (*c*) is Nova Zembla, to the south.

The islands are of volcanic origin, formed principally of basalt. Fossils of animals and plants have been found in the lower strata, many of these remains tending to prove that this desolate region was once the home of animals and plants now found only in warm climates (see GEOLOGY). Although high in Arctic regions, the temperature is not as low as might be expected; the average for the coldest month is 19° below zero and the thermometer frequently rises to 35°.

FRASER, *fra'zer,* **RIVER,** a river of Western Canada, noted for its salmon fisheries and for the magnificent scenery and the rich gold fields through which it flows. Its course lies wholly within the province of British Columbia, and its drainage basin, which has an area of 142,000 square miles, includes most of the southern half of the province, with the exception of the southeast corner and a strip along the Pacific coast.

The Fraser is formed by the junction of two forks at a point a short distance northeast of Fort George, in the central part of the province. The North Fork, short and not important, rises in the Rocky Mountains near Smoky River Pass and flows almost straight west. The South Fork, which is the main river, rises in the Rocky Mountains near Yellow Head Pass and flows northwest for 160 miles to meet the North Fork. The united river makes a sharp curve around the northern end of the Cariboo Mountains, and then flows southward almost to the international boundary. Then it turns sharply to the west and empties into the Gulf of Georgia between Vancouver Island and the mainland. The total length of its course is 695 miles.

A few miles southwest of the junction of the North Fork and the South Fork, the Fraser receives from the west the Stuart River, carrying the surplus waters of Fraser Lake and Stuart Lake. Its other important tributaries, in order, are the Blackwater from the west; the Quesnel from the east; the Chilcotin from the west, and, most important of all, the Thompson, one of whose branches rises in the Rocky Mountains less than fifty miles from the source of the North Fork of the Fraser itself. Southward from Lytton, where it receives the Thompson, the Fraser River flows in majestic canyons which it has cut through the Coast Range.

The Fraser is a typical mountain stream, swift throughout its length and in many parts not navigable even for canoes. It is navigable for small steamboats from its mouth to Yale, a distance of eighty miles, and from the mouth to New Westminster, fifteen miles, it is navigable for ships drawing twenty feet of water. The Fraser might be called the economic heart of British Columbia, for it contributes to the three chief industries, mining, lumbering, and fishing. The placer and vein gold along its banks and the banks of the Thompson first drew the world's attention to the region and stimulated its growth. The river valley, particularly in the lower course, is densely wooded, and the rapid current supplies facilities for the transportation of lum-

ber. Lastly, the Fraser River salmon are justly famous, and the fisheries are the most important in Canada. For additional information relating to these industries, see BRITISH COLUMBIA.

FRASERVILLE, *fra'zer vil,* the county town of Temiscouata County, Quebec, situated in the southeastern part of the province and on the right bank of the Saint Lawrence River, at the point where it receives the waters of the Rivière du Loup. Rimouski is sixty-six miles northeast, and Quebec is 115 miles southwest. Railway transportation is provided by the Intercolonial and Temiscouata railways; the latter makes Fraserville its terminus. There is regular steamer service by the Saguenay Line, and local lines ply between Fraserville and Tadoussac, a seaside resort. The place was settled in 1874, and was incorporated as a city in 1910. Fraserville is the corporate name for the town of Rivière du Loup. French Canadians comprise the greater part of the population, which in 1911 was 6,774; in 1916, estimated, 7,000.

The city lies in the midst of some of the most picturesque scenery of the province, in a locality that offers fine fishing and hunting (moose and deer); consequently it has won favor as a summer resort. There are several hotels, also an armory, a $50,000 post office and large wholesale houses. Besides the public schools, there are three colleges and a convent. The largest industrial establishments are the repair shops of the railroad; these employ about 400 men. Pulp mills, gristmills, brickyards, foundries and factories for making butter, furniture and building materials are among the other manufactories. Abundant water and electric power is provided for manufacturing purposes. E.T.

FRATERNAL SOCIETIES, voluntary associations formed for the purpose of mutual advantage, and conducted solely for the benefit of members and beneficiaries. These societies are organized on the lodge system, with rituals and pass words, and each member pays, by means of assessment, a certain amount to the common fund. Each society has general power to adopt its own constitution and by-laws, within limitations, and may manage its own internal affairs as it deems to its best interests. Men alone are eligible to membership in some of these societies; others admit both men and women, and a few are for women only. A number of them have memberships running into the millions.

History. The early fraternal societies were founded somewhat along the same lines as the English "friendly societies," which were first organized as clubs for the sick and paid small sums for the benefit of their members. This idea finally developed into payment also for disability, funerals, accident, disease and old age benefits. Several of these societies founded branches in the United States and Canada in the early part of the nineteenth century. In 1868 the Ancient Order of United Workmen was founded by John Upchwich, it being the first order in the United States to develop coöperative relief on a large scale, in the form of life insurance or death benefits. During the next ten years many other fraternal societies were organized, and from 1881 to 1890 many additional ones were introduced; but the greater proportion of these were short-lived, owing to unsound financial methods. Since 1900 there have been few new societies organized.

Governing Methods. All the older associations elect representatives from the subordinate lodges within what is known as the grand jurisdiction limit. The latter, in turn, sends delegates to the supreme body, which is the highest authority. The grand jurisdiction usually covers a state, and has supervision of all the lodges in its territory. The supreme body generally elects its officers, but they may in some cases be elected by a direct vote of all the members.

In 1898 The American Fraternal Congress was formed for the purpose of establishing reserve funds, and in 1901 the younger fraternal societies formed the Associated Fraternities of America. In 1903 these general societies united under the name of the National Fraternal Congress of America.

Membership. The principal organizations in the United States and Canada having more than 200,000 members in 1917 are listed below:

Freemasons	1,760,277
Odd Fellows	1,622,100
Modern Woodmen of America	921,899
Eastern Star, Order of	800,000
Woodmen of the World	732,385
Knights of Pythias	729,053
Rechabites, Independent Order of	701,040
Good Templars, International Order	620,000
Loyal Order of Moose	620,000
Improved Order of Red Men	479,033
Benevolent and Protective Order of Elks	442,658
Order of Eagles	400,000
Royal Arch Masons	422,359
Ancient Order of United Workmen	350,000
Knights of Columbus	346,560

Order of Owls	346,754
The Maccabees	331,756
Ancient Order of Hibernians	250,000
Royal Arcanum	244,722
Knights Templar	237,368
Foresters of America	205,756
Independent Order of Foresters	218,074

FRATERNITY, *fra ter' ni ti,* from the Latin word for *brother,* is the name of a society of college or university men for social or literary purposes. A similar organization for women students is known as a *sorority,* from the Greek word for *sister* (see SORORITY). Both are commonly called "Greek-letter Societies," because each organization takes its name from the initials of the two or three Greek words forming its secret motto.

Origin. The parent of the fraternities is *Phi Beta Kappa.* It was founded by five young men, students in the College of William and Mary, of Virginia, as long ago as the stirring days of 1776. They took as their motto, "A happy spirit and resolution of attaining the important ends of society." Branches were soon established at Yale and Harvard, called respectively the *Alpha of Connecticut* and the *Alpha of Massachusetts,* Alpha conveying the idea of *first.* In 1780, however, the parent society discontinued its meetings, for the Revolutionary War was at the very doors of the college. In the confusion of the times its secrets came to outside ears, and little by little its character changed, until to-day it is a purely *honorary fraternity* and not a secret society. Membership in *Phi Beta Kappa* is considered one of the greatest distinctions that can be conferred on the college student, since only those are admitted who achieve high standards of scholarship and are known to possess excellent character.

Organization. Some fraternities are merely local in character, while others are national, with many affiliated branches called *chapters.* Some of the older fraternities have as many as seventy-five or more chapters, and the tendency is for the newer organizations to combine with those that are firmly established. A chapter of a general or national fraternity may be formed in any college or university, but there can be only one chapter of the same fraternity there, and a student may belong to only one fraternity. Each year, as a rule, the fraternity holds a general convention to which the various chapters send delegates. At these conventions elections are held and all laws for the government of the fraternity are passed. The affairs of the fraternity are in charge of an executive council, which is usually incorporated and in whose name all property is held. Many of the larger fraternities maintain *chapter houses* at the chief universities. While some of these are merely for holding business and social meetings, others are conducted on the same lines as any of the large clubs for men, and provide living accommodations for members.

Views Regarding Fraternities. There has been considerable difference of opinion regarding the fraternity feature of college life. In the past many universities even had anti-fraternity laws, but in nearly all cases these have now been repealed. Those who oppose the fraternities do so on the ground that they lead to snobbishness, tend to create class distinctions, and therefore are out of harmony with the democratic spirit that should rule the American or Canadian university. They maintain also that fraternities constitute cliques which try to run college politics for the benefit of their members, that their very secrecy is harmful, and that they are crowding out the fine old literary societies that were once the distinction of the individual colleges.

Those favoring the fraternities point to the fine spirit of fellowship and sympathetic interest that compensate the student, in a measure, for the absence of home life. By bringing together those who have interests in common, the fraternities are helping to lay the foundations of many a friendship that will enrich life long after college days are over. It is argued, too, that the fraternities are a real aid to good college government, since each member feels a personal responsibility for the good name of his chapter and is anxious that it should stand well with the faculty. It is also true that the fraternities do much to keep alive the traditions of a college or university and to create loyal alumni. It is the general belief that dissipation is declining and scholarship improving in the fraternities in all strong colleges and universities.

Whatever may be the objections to the fraternities, it is certain that they are growing in strength year by year and are fast becoming the most important factor in American college life, so far as the social side is concerned. At the present time Yale is the only great university that excludes them.

High School Fraternities. In recent years there has been a marked tendency among high school students to form secret societies modeled on those of the college. The high

school organizations, like those of the colleges, are Greek letter societies; secret initiation rites are practiced, and secret rules adopted. Because of the immaturity of the students, educators as a rule strongly object to such societies, claiming that they foster the clique spirit and are harmful to the development of a feeling of school loyalty. In many cities, the school boards expressly forbid the organization of high school fraternities, and in some states they are prohibited by law. L.M.B.

FRAUD, in law, comprises all false representations or deceitful practices which have for their object defrauding or gaining unfair advantage of another. Fraud is arbitrarily punished according to the laws of the state or province wherein the act is committed, but no action can be maintained unless damages can be proved.

Fraud is said to be *actual* or *constructive.* Positive or actual fraud includes cases of intentional misrepresentation used to accomplish a purpose which is illegal. Legal or constructive fraud includes such acts or contracts as have a tendency to deceive or mislead others. Any contract or instrument in writing may be declared void if induced through fraud, and if both parties act fraudulently neither can take legal advantage of the other's acts. The Statute of Frauds, enacted in England in 1673, has been recognized of such importance that every state in the American Union and the provinces of Canada have practically reënacted it and made some of its provisions even more stringent.

FRÉCHETTE, *fray shet',* Louis Honoré (1839-1908), a French-Canadian journalist and poet, generally acknowledged as the greatest poet of his race. Though his first volume of poems appeared in 1863, when he was only twenty-four years old, he was for many years better known as a journalist than as a poet. In fact, it was not until he had reached middle life that he gave up active newspaper work and devoted himself to literature.

LOUIS H. FRÉCHETTE

Fréchette was born at Lévis, Quebec, attended Quebec Seminary and Laval University, and in 1864 was called to the bar. As the law, however, was not particularly attractive to him, he founded the *Journal de Lévis,* a newspaper in which he expressed such revolutionary views on public affairs that Canada no longer seemed a safe place for him. From 1866 to 1871 he did newspaper work in Chicago. Then, returning to Canada, he practiced law until 1879, when he again became the editor of a newspaper. He served in the Dominion House of Commons from 1874 to 1878, but was defeated for reëlection, and was again defeated in 1882, thereafter taking no active part in politics. At one time he was strongly in favor of the political union of Canada and the United States, but later in life became less enthusiastic over the plan.

Fréchette's poetry is strongly lyrical, and shows the inspiration of natural beauties, of friendship and family ties. Through all of it, moreover, runs a strong patriotic strain, a sympathy for the race which regards him as its representative poet. Among his many volumes of verse may be mentioned *Veronica,* a drama; *Mes Loisirs,* his first book; *La Voix d'un Exile,* a satire written in 1867 and directed against the Canadian government; and *Les Oiseaux de Neige,* which received the laurel crown of the French Academy. He also wrote two historical dramas, *Papineau* and *Felix Poutré,* and a number of essays and prose sketches, and he translated into French William D. Howells' *Chance Acquaintance* and George W. Cable's *Creole Days.* G.H.L.

FRED'ERICK, the name borne by three Prussian kings, the third of whom also ruled as emperor of Germany.

Frederick I (1657-1713) was the first sovereign to wear the crown of Prussia, and though his reign was uneventful, the creation of the new royal title was an important landmark in the history of Germany and of Europe. He was the son of Frederick William, the Great Elector of Brandenburg, and succeeded his father as elector in 1688. He realized his great ambition, to rule as king of Prussia, by giving aid to the Emperor Leopold I in the War of the Spanish Succession, and was crowned in 1701. Frederick was the friend and patron of learned men, and the founder of the University of Halle.

Frederick II (1712-1786) is known in history as Frederick the Great, and his name is associated with the most important events of his time. He was the son of Frederick William I of Prussia and Princess Sophia of Hanover,

sister of George II of England. In the first year of his reign (1740) he marched an army into Silesia, one of the fairest provinces of Maria Theresa of Austria, an act which brought on the great European conflict known as the War of the Austrian Succession. After eight years of warfare a peace treaty was signed at Aix-la-Chapelle, the terms of which have been aptly summarized by Carlyle, Frederick's biographer, in these words: "To Frederick, Silesia; as to the rest, wholly as they were."

FREDERICK THE GREAT

He sent a note accompanying a gift to George Washington in which he testified to the genius of the great American in these words: "From the oldest general in Europe to the greatest general in the world."

During the next few years Frederick devoted himself to the improvement of the Prussian military system and the development of his country's resources. In the meantime, however, Maria Theresa was taking steps to recover the territory she had lost in the previous war, and she succeeded in forming an alliance with France, Russia, Sweden and many of the Germanic states, for the humbling of her Prussian enemy. Frederick, though half of Europe was leagued against him, anticipated the movements of his foes by invading Saxony (1756), and the Seven Years' War (which see) began. This terrible conflict ended, in 1763, with the Treaty of Hubertsburg, which left Silesia still in the hands of Frederick. Prussia emerged from the struggle the equal of Austria, and the foundation was laid for the union of the German states and the formation of a great empire.

About ten years after the close of the Seven Years' War, Frederick joined with Catharine II of Russia and Maria Theresa in what is known as the First Partition of Poland, thereby making an important addition to his dominions. His whole policy was directed toward the upbuilding of the Prussian state, but he was as great in peace as in war. The years following the Peace of Hubertsburg were given up to the development of the material prosperity of his kingdom. He built roads and canals, encouraged manufactures and agriculture and brought the administration of the government to a high degree of efficiency. His own tastes were those of a philosopher and a poet, and he gathered about him the most distinguished men of his time. Among these was the great French writer, Voltaire.

Frederick III (1831-1888), the only son of William I, king of Prussia and first emperor of united Germany, succeeded his father in March, 1888. Three months after his accession he died. During the reign of his father he took an important part in the affairs of state, and he was in personal command of troops in the Seven Weeks' War with Austria in 1866 and in the Franco-German War. Frederick was a man of cultivated tastes and a believer in government by parliament. He was succeeded by his son, Emperor William II, the present ruler of the German Empire.

Related Subjects. The reader is referred to the following articles in these volumes:

Bismarck-Schönhausen	Poland
Franco-German War	Prussia
Frederick William	Seven Weeks' War
Maria Theresa	Succession Wars

FREDERICK I, surnamed BARBAROSSA, or RED BEARD (1122-1190), succeeded his uncle, Conrad III, as king of Germany in 1152, and was crowned Holy Roman Emperor in 1155. During the greater part of his reign he was engaged in a struggle with the powerful Italian cities which were joined together in a union known as the Lombard League. In 1176 his forces were overwhelmingly defeated on the field of Legnano, and in 1183 the emperor concluded with the League a peace treaty which granted the cities the right to manage their domestic affairs.

In 1189, having proclaimed peace in all his dominions, he set out on a crusade to the Holy Land (see CRUSADES). After defeating the Mohammedans in two battles, he was drowned while crossing a small stream in Asia Minor. The news of his death brought the greatest sorrow to his German subjects, who had come to look upon him as the highest representative of the ideal of German nationality. In the course of time a legend sprang up that some day he would return to earth to make the German people a strong and united nation.

FREDERICK VIII (1843-1912), king of Denmark from 1906 until 1912, was the son and successor of Christian IX. During his brief and quiet reign he gained the sincere affection and respect of his people because of his kindly manner and democratic ideals. He was a man of cultivated and scholarly tastes, and at one

time was chancellor of the University of Copenhagen. He was a brother of Queen Alexandra of England and of King George I of Greece, and his second son, Charles, became the ruler of Norway in 1905 with the title Haakon VII. Frederick was succeeded by his son Christian X.

FREDERICK WILLIAM (1620-1688), commonly called the GREAT ELECTOR, who as ruler of Brandenburg from 1640 to 1688 laid the foundations for the greatness of Prussia (see BRANDENBURG; PRUSSIA). When at the age of twenty he succeeded his father as elector he found Brandenburg sadly desolated by the ravages of the Thirty Years' War, and at once began to regulate the finances, to repopulate the deserted towns, and to create a standing army. For several years he was engaged in warfare against Louis XIV of France and the Swedes, defeating the latter in a decisive battle at Fehrbellin (1675). After concluding peace with his enemies he devoted himself to the interests of his people. He encouraged the industries, opened up canals, established a postal system, reorganized the universities of Frankfort and Königsberg and founded the Royal Library at Berlin, leaving to his son Frederick, in 1688, a prosperous country and a well-filled treasury. See ELECTOR.

FREDERICK WILLIAM, the name of four kings of Prussia, three of whom were of outstanding importance.

Frederick William I (1688-1740) succeeded his father, Frederick I, in 1713. He established an admirable system of administration, strengthened the financial condition of the country, and organized and drilled a splendid army of 80,000 men. To satisfy his love for tall soldiers, he resorted to most outrageous methods to secure them, forcing such men into his service by kidnaping them. During his reign a large part of Pomerania was wrested from Sweden and annexed to Prussia.

Frederick William III (1770-1840), who came to the throne in 1797, was the son and successor of Frederick William II. During the first part of his reign he refused to enter the coalition of the nations against Napoleon, but finally yielded to the demands of his people and sent an army against the great conqueror. In 1806 his forces were overwhelmed by the French at Jena and Auerstädt, and in 1807, by the Treaty of Tilsit, he was forced to cede one-half of his dominions to France, while the half that remained became in reality a province of Napoleon's empire. The next few years were a period of regeneration for humiliated Prussia, and it was one of Frederick William's generals, the famous Blücher, who saved the day for the allies at the Battle of Waterloo, where Napoleon suffered his last defeat. After the conclusion of peace Frederick William joined with Czar Alexander I and Emperor Francis of Austria in the formation of the HOLY ALLIANCE (which see). Though he was opposed to popular liberty, he contributed to the material prosperity of his people, and during his reign the German customs union (see ZOLLVEREIN) was established.

Frederick William IV (1795-1861), son of Frederick William III, succeeded to the throne in 1840. During his reign Prussia joined the ranks of liberal states, for in 1848, the year of popular uprisings throughout Europe, he yielded to the demands of his subjects, who had risen in arms in Berlin, and agreed to grant them a constitution. Though the constitution finally adopted greatly restricted the liberties of the people, it marked the beginning of a new political system for Prussia. In 1857 Frederick William began to suffer from attacks of insanity, and in 1858 the government was placed in the hands of his brother William, the heir apparent, who succeeded him in 1861. See GERMANY, subtitle *History;* PRUSSIA.

FREDERICK, MD., a city of historical interest, made famous by the poet Whittier as the scene of Barbara Frietchie's patriotic act (see BARBARA FRIETCHIE). It is the county seat of Frederick County, and is situated in the northwestern part of that portion of the state which lies east of West Virginia. Washington, D. C., and Baltimore are respectively fifty-seven and sixty miles southeast, and York, Pa., is fifty-six miles northeast. The Baltimore & Ohio Railroad, constructed to the city in 1831, and the Pennsylvania Railroad, built in 1871, serve the city. The Hagerstown & Frederick Railway (electric), constructed in 1904, connects with towns to the north, west and south. The population in 1916 was estimated to be 11,112; in 1910 it was 10,435.

Frederick is an industrial city of importance, possessing large canning establishments, flour mills, brick works, planing mills and manufactories of tobacco products, hosiery, leather and coaches. Its canning factories furnish large supplies to the United States government; the second largest flour mill in the United States, one of the largest brush fac-

tories, and a $200,000 abattoir plant are located here. Besides its public schools the city has the Women's College (Reformed Church), organized in 1893; Hood Seminary, Boyd Academy, a convent and a library.

Frederick was settled in 1745, was incorporated as a city in 1817 and named for Frederick, Prince of Wales, son of George II.

The remains of Francis Scott Key, author of *The Star Spangled Banner,* lie in Mount Olivet Cemetery, and the entrance bears a striking monument erected to his memory. Frederick is also the burial place of Roger B. Taney, American jurist and statesman, and of Barbara Frietchie. In the vicinity the "first Methodist church in Maryland and in America" was organized in 1764 by Robert Strawbridge. O.C.W.

FRED'ERICKSBURG, BATTLE OF, an important engagement of the War of Secession, took place at Fredericksburg, Va., December 13, 1862, between the Federals under General Burnside, numbering about 113,000 men, and the Confederates, numbering about 78,000 men, under General Lee, aided by Jackson and Longstreet. After his retreat from the North following his defeat at Antietam, Lee established himself on the high bluffs overlooking Fredericksburg, on the south side of the Rappahannock River, a well-fortified position. Burnside was stationed at Falmouth, on the opposite side of the river. On December 12 the latter crossed the river with his army in three divisions, and on the following day advanced against Lee on Marye's Heights, withdrawing after six ineffectual assaults. His loss was 12,500 men, against the Confederates' 5,400. As a result of this defeat, Burnside was removed from the command of the Army of the Potomac.

FRED'ERICTON, capital of the province of New Brunswick, Canada, situated on the Saint John River, eighty-four miles from its mouth and sixty-seven miles northwest of the city of Saint John. It is well located and is protected on three sides by a range of hills. Large seagoing vessels navigate the river to Fredericton, and smaller vessels penetrate about seventy miles farther into the interior. Lumbering is the chief industry, but the city has important manufactures of boots and shoes, especially the "shoepacks" of rough tanned leather worn by lumbermen. Canoes and motor boats are also made and there are iron foundries and tanneries. The town was founded in 1740, when it was named Saint Anne. In 1786 the name was changed to Fredericton, and two years later it became the capital of the province. Population in 1911, 7,208. R.H.S.

FREE CITIES, the name applied to certain cities of Germany, which gained complete independence in the twelfth century by assistance given the emperors in repressing the arrogance of the nobles. In return for this help they received certain privileges and immunities and became imperial cities. The most important privileges were that they should enjoy free government; should never be forced to swear allegiance to any emperor or king, nor become engaged in any expedition against the Romans, or in any way to be reckoned among the cities of the empire. The only free cities now existing are Hamburg, Lübeck and Bremen, each sending members to the legislative body of the German Empire. At the time of the French Revolution there were fifty-one free cities; but with the exception of the three cities named they have all been deprived of their privileges as a result of various political changes.

FREEDMEN'S BUREAU, a Bureau organized by an act of Congress March 3, 1865, for the supervision, temporary maintenance and employment of the emancipated negroes of the South, who were left homeless and penniless after the War of Secession. It was headed by a commissioner, with assistant commissioners in all the states that had been a part of the Confederacy; these issued supplies to destitute negroes, had charge of abandoned lands to lease and ultimately to sell in forty-acre plots, and they also controlled all matters relating to refugees and freedmen. The Bureau continued its work until 1870 and expended over $15,000,000. It was one cause of continuing the enmity of the South toward Congress, for it led to the gathering of idle and worthless negroes around the Bureau depots, and so caused great hardship to the planters who could not secure laborers to pick their cotton.

FREEMAN, MARY E. WILKINS (1862-), an author of short stories and novels which portray the humor and pathos of the everyday life of the people of New England. Mrs. Freeman was born in the village of Randolph, Mass., and has an intimate knowledge of and deep sympathy with the lot of her characters. The plot in her stories is not so important as the strong delineation of character and the pictures of bits of human nature; country women in the grim routine of colorless days; weather-worn farmers with their touches of

awkward gallantry; children with their little pleasures and heartaches, and so on. *Pembroke* (1894) is regarded by literary critics as Mrs. Freeman's best work, although *The Portion of Labor,* a story of a labor strike in a mill town, is a masterly production. She was married in 1901 to Dr. Charles M. Freeman, of Metuchen, N. J.

MARY E. WILKINS FREEMAN

FREEMASONRY. See MASONRY, OR FREEMASONRY.

FREE METHODISTS, a religious sect, an offshoot from the Methodist Episcopal Church. The Free Methodist Church was organized at Pekin, in Western New York, August 23, 1860. Its founders were preachers who believed that the parent Church was departing from fidelity to the clear doctrines and simple usages of Wesley. The Free Methodists were distinguished for a time as *Nazarites,* which indicated an assumption of higher piety and holiness than the members of the parent Church. They insisted on plain dress and address, and that the members should shun what are commonly known as worldly practices, vices and pleasures. They prohibited the use of intoxicating liquors and tobacco, and tried to get back to the old fountain-spring of Methodism. In these respects they are more radical than members of any other Protestant body. The zeal of the Free Methodists is shown in their shouting, by lengthy addresses at religious meetings and in giving "testimony" to the saving grace of the Redeemer. In 1889 their preachers numbered 600, traveling and local. Their membership is now about 30,000, and their churches about 1,000 in number. They have two seminaries, one at North Chili, N. Y., and one at Spring Arbor, Mich.

FREEPORT, ILL., the county seat of Stephenson County, in the northwestern part of the state, is twenty-eight miles west of Rockford and 113 miles west by north of Chicago. It is on the Pecatonica River and is served by the Illinois Central; the Chicago & North Western, and the Chicago, Milwaukee & Saint Paul railroads, and by an electric interurban line to Rockford. In 1910 the population was 17,567; it was 19,568 in 1916, by Federal estimate.

The city has a Federal building, a Y. M. C. A. building, erected at a cost of $110,000, a library and Saint Vincent's Orphanage. The manufactures include automobiles, buggies, gasoline engines, hardware, windmills, agricultural implements, pianos, organs, medicines and toys.

Freeport was settled in 1835 and incorporated in 1859, and it became a city in 1885. One of the famous Lincoln-Douglas debates was held here in 1858.

FREE PORTS, a name given to certain cities on the seaboard where no customs duties are levied and where no customs supervision exists. Ships may enter, on payment of a moderate toll, and may load and unload in these ports. Cargoes are deposited and handled, and goods are bought and sold without action on the part of taxing authorities.

In Great Britain free ports have never existed; in 1552 it was planned to place Hull and Southampton on this footing, but the plan was abandoned. In Denmark, an area of about 150 acres at Copenhagen was opened as a free port in 1894 to attract the trade of the Baltic seaports. In Germany, since 1888, only Hamburg remains a free port. An area of about 2,500 acres is exempt from customs duties and supervision. Sulina, in Rumania, is a free port. In 1895 free ports were opened at Kola, in Russian Lapland. Malacca, Penang and Singapore have been free ports since 1824, Hongkong since 1842, and Weihaiwei, China, since it was leased to Great Britain in 1898. Macao has been a free port since 1845.

In the United States there are no so-called free ports, but Congress has passed laws whereby customs duties need not be paid when imported goods are unloaded. Such merchandise, if not needed at once by consignees, may be placed "in bond" in government warehouses, and the duty may be paid when it is removed later.

FREE-SOIL PARTY, a political organization in the United States in the decade preceding the War of Secession, founded on opposition to the extension of slavery in the Territories and opposed to their later admission to the Union as slave states. It was organized in 1848 in Buffalo, N. Y., was strengthened by the support of Martin Van Buren and the Barnburners, and in the same year nominated Van Buren for the Presidency. The party polled nearly 300,000 votes, on the platform

"Free Soil, Free Speech, Free Labor and Free Men," and although it did not carry any state it elected fourteen members of Congress, and was strong enough to send Salmon P. Chase and Charles Sumner to the Senate. In 1852 the party strength was only half of what it had been in the preceding general election, owing largely to the defection of the Barnburners. In 1856 the Free-Soilers joined the newly-formed Republican party. See POLITICAL PARTIES IN THE UNITED STATES.

FREE'THINKER, a term applied to those who refuse to accept Divine revelation, and who feel free to adopt any opinion in religious or other matters which may result from their own independent thinking.

In the seventeenth century the name was claimed by those who took part on the anti-Christian side in the religious controversies. Anthony Collins (who first made it a name of a party by his *Discourse of Freethinking*) and his friend, John Toland, are among the chief of the early freethinkers. Lord Bolingbroke and Hume were among the leading later freethinkers. In France, Voltaire and the encyclopedists, D'Alembert, Diderot and Helvetius, are among those who argued for natural, as against revealed, religion. In the reign of Frederick the Great the same spirit became fashionable in Germany. Freethinkers to-day are unorganized, and their numbers appear not to be large. Voltaire is their inspiration. See VOLTAIRE.

FREE'TOWN, the principal seaport of West Africa, capital of the British colony of Sierra Leone and headquarters of the troops of the West African garrison. Until recent years the town was commonly referred to as "the white man's grave," for the climate was so unhealthful that few Europeans could live there. The surrounding swamps have now been drained and living conditions consequently have greatly improved. The natives are skilful in gold and silver work, and a large export trade is carried on in rubber, gold, palm oil, gums, nuts and ginger. The city is strongly fortified, has an excellent harbor and is a coaling station for vessels of the British navy patrolling the African coast. Population in 1911 37,724, of whom about 500 were Europeans.

FREE TRADE, in economics and government, is the name given to the policy which aims to encourage the greatest possible commercial intercourse between the various nations of the world. This policy teaches that the exchange between nations ought not to be restricted by laws or tariffs that favor the home producer. A nation that adopts free trade does not give any assistance to the home industries, either in imposing customs duties on foreign products or by offering a bounty on home products. It means, in other words, that all the producers, either home or foreign, are treated exactly alike in the market of that country. The opposite policy, which maintains that a state can reach a high degree of material prosperity only by protecting its home industries from the competition of similar foreign industries, is known as *protection* (which see).

Great Britain is the only great industrial country of the world that has adopted free trade. Belgium and Holland have also tariffs that are only slightly protective. The rest of Europe, the United States and all the self-governing British colonies have adopted the policy of protection. Customs duties and taxes imposed for revenue purposes only are not opposed to the principle of free trade.

The Theory of Free Trade. Briefly, the economic principles on which free trade is based are stated from the standpoint of those who advocate it. The first and foremost of these is the well-known economic principle of the *division of labor* and the specialization and organization that accompany it. Division of labor in this case means that each country would be able to concentrate its energies in the production of those commodities for which it is best fitted by its natural resources, geographical position, skill of its inhabitants, and so on. But commodities are produced in order to be consumed or *exchanged* for other goods. There must therefore be the widest opportunity for each country to exchange its products for those of other countries. Free exchange, or freedom of trade, becomes therefore the necessary condition for the realization of this international division of labor. Foreign trade, just like domestic trade, is nothing else than an exchange of goods for other goods, in which both parties to the transaction are the gainers, for each of them obtains goods more desired than those with which it parted. Freedom of trade, which allows the capital and labor of each country to be used in those industries that are most suitable to that country, secures the greatest production of goods to the greatest advantage of the consumers.

The development of the material resources of the world and the production of wealth contribute to the welfare and to the progress

of mankind. Competition in the open market between the goods produced assures consumers the best and cheapest terms. As most men, in whatever branch of production they may be engaged, are consumers of a great number of purchased commodities, cheapness of these commodities is of the utmost benefit to them. As we see, free trade considers the question from the point of view of the consumer, and regards consumption of goods as the aim of all production.

To sum up, free trade maintains that in order to secure the greatest abundance of goods in the world as a whole and the greatest benefit to the consumer there ought to be complete freedom of trade between the nations. Those who believe in the policy of free trade urge that no artificial barriers, in the form of customs duties or other restrictions, should be erected which will interfere with the free exchange of goods between nations.

The economic principles on which free trade is based are undoubtedly sound, but it is a question whether this policy is desirable in the present state of unequal national development. Many who accept free trade as a final goal insist that its immediate application would retard the development of skill-using manufacturing industries in the less-advanced countries, and cause them to remain too long mere producers of food and raw materials, missing the greater rewards which skill and organization command.

Moreover, the conduct of nations is not determined simply by economic factors, however powerful these may be. Political and social considerations, such as national safety, national defense, national economic independence, as well as national hatreds and jealousies, play just as important a rôle in the choice made by a nation between the free trade and the protective system.

Under which system these aims could be best attained has formed the subject of fierce controversies, raging in almost every nation. For the present most countries cling to the protective system. For other arguments in favor or against free trade, see the article PROTECTION, in these volumes. E.A.R.

Consult Cunningham's *Rise and Decline of the Free Trade Movement;* Mathews' *Taxation and the Distribution of Wealth.*

FREE WILL, the power of human beings to make deliberate choice in matters of conduct. It implies that man is a free agent, able to decide for himself which of several possible courses of action he shall adopt. The opposite idea is that his choice is determined for him by a series of causes over which he has no control, such as outside circumstances, environment, heredity, moral influences, all his previous experiences and actions, his impulses, instincts, habits and other internal motives. This counter-theory is called *determinism,* and over the two doctrines philosophers have disputed long and fiercely from the time of the first thinkers down to the psychologists of to-day.

The controversy over *predestination* (which see) took up the religious phase of the question, but modern discussion concerns itself almost exclusively with the ethical aspect. Those who uphold the freedom of the will rest their case chiefly upon the argument that unless man is free to choose there is no value or purpose in moral law, and no justice in holding anyone responsible for his actions.

An analysis of the controversy on the subject shows that in discussing the arguments for and against free will the philosophers have had in mind no fewer than six different kinds of freedom, and much of the confusion can be traced to the attempt to prove one meaning of free will by facts properly related to an entirely different meaning. Inevitably, however, the question of free will is one on which there can probably never be perfect agreement. See WILL; HEREDITY.

FREEZ'ING, the process, not yet fully understood, which turns a liquid into a solid when its temperature is sufficiently lowered. Each substance has its own *freezing point,* which is always the same under ordinary conditions. Thus, the freezing point of water is always 32° Fahrenheit—a fact which is depended upon in making a thermometer. Except in mixtures and solutions, the freezing point of the liquid is also the *melting point* of the solid; so that ice again becomes water at a temperature of 32°. This is sometimes called the *point of fusion.*

All fluids do not freeze at the same temperature. Mercury, for instance, becomes solid at about 39° below zero F., and for that reason thermometers for exceedingly cold regions are made with alcohol instead of mercury, since alcohol does not freeze until it reaches a temperature of 202° below zero F. Salt water freezes at a lower temperature than fresh water. The approximate temperature at which sea water freezes, for instance, is 28.5° F., and the more salt there is in solution, the lower the freezing point drops.

While most substances contract when they freeze, it is a curious fact that water expands. This explains why water-pitchers sometimes crack and water-pipes burst on "freezing cold" nights. It accounts also for one form of erosion, for the moisture which has found its way into the crevices of rock freezes during the winter and expands, creating great fissures and breaking off pieces here and there. It is for the same reason that an iceberg floats; that is to say, since the water expands in freezing, ice is less dense than water and, being lighter, is naturally floated by the water around it.

Another interesting fact is that the freezing point is *lowered* by pressure. Therefore, when pressure is applied to ice it melts, although it freezes again when the pressure is removed. It is this quality of ice that enables us to enjoy the pleasures of skating. The narrow blade of the skate, bringing the entire weight of the body to bear down upon the ice, for the moment of contact melts a thin strip of ice beneath the blade. The surface water that results from the melting process makes the ice slippery, and the skater glides easily along. The same principle comes into play when a boy makes a snowball; the pressure of his hands melts the crystals, forming a film of water that freezes again as soon as the pressure is released.

Related Subjects. The reader is referred to the following articles in these volumes:

Erosion	Melting Point
Ice	Thermometer

FRE'MONT, John Charles (1813-1890), an American explorer, soldier and political leader, who displayed remarkable initiative and energy as leader of several expeditions through the Rocky Mountain regions and westward to the coast, and whose investigations gave the United States government valuable information concerning the great unexplored Western country. He was born in Savannah, Ga., and was educated at Charleston College, South Carolina. In 1842, after several years of experience in the government-survey service, he was placed at the head of an expedition to the far west, and on this journey he ascended the highest mountain of the Wind River Range, now known as Fremont's Peak, in his honor.

The following year he led out a second expedition for the purpose of completing the survey to the mouth of the Columbia River, and sent to Washington valuable and interesting descriptions of Great Salt Lake, the Great Basin, the Sierra Nevada Mountains and the river basins of the Mexican province of California. In 1844 he was made captain, and the following year was commissioned by the government to lead a third expedition to California, the purpose of which was to help the United States gain possession of that province in the event of war with Mexico.

JOHN C. FREMONT
One of America's notable men in the middle of the nineteenth century.

Fremont took an active part in the conquest of California (see California, subhead *History*), and was made military commander and civil governor of the territory by Commodore Stockton, the officer in command. In 1846, however, a United States force under General Kearny arrived, whose authority Fremont refused to recognize. For this he was court-martialed, and, having been convicted of mutiny and disobedience, was sentenced to dismissal from the service. Though President Polk remitted the sentence, Fremont felt that he had been deeply wronged, and in 1848 he resigned.

Later he conducted two other exploring parties over the Rocky Mountains, but without accomplishing anything of importance. Between 1849 and 1855 he made his home in California, and in 1850 was elected one of the first two Senators from that state. He was also the first Presidential candidate of the Republican party, being the unsuccessful opponent of Buchanan in the election of 1856. On the outbreak of the War of Secession he was raised to the rank of major-general and given command of the Western Department, with headquarters at Saint Louis. In this position, and in a second one to which he was transferred a few months later, he showed what his superiors considered lack of judgment and executive ability, and in 1864 he retired from active service. Fremont's most important work in the years that followed was his service as governor of the territory of Arizona, from 1878 to 1881. Shortly before his death he was appointed major-general on the retired list, by act of Congress. For an account of his labors, consult his *Memoirs of My Life*. B.M.W.

FREMONT, Neb., the county seat of Dodge County, is situated in the east-central part of the state, thirty-seven miles northwest of Omaha. It is on the Platte River and on the Chicago, Burlington & Quincy, the Chicago & North Western and the Union Pacific railroads. The area of the city is four square miles. In 1910 the population was 8,718; in 1916 it was 9,925, by Federal estimate. Fremont is in a farming section, has dairying and live-stock interests, and is an important grain market. Its industrial plants include machine shops and mattress and incubator factories. It is the seat of the Fremont Normal School, and has a courthouse, Carnegie Library and orphans' home (Lutheran). Fremont was settled in 1857, incorporated in 1871 and obtained a revised charter in 1901.

FREMONT, Ohio, the county seat of Sandusky County, is situated in the northwestern part of the state, thirty miles southeast of Toledo. It is at the head of navigation on the Sandusky River, has boat and interurban service, and is on the New York Central and the Wheeling & Lake Erie railroads. The area of the city is nearly four square miles. In 1910 the population was 9,939; in 1916 it was 10,882, by Federal estimate.

Fremont has several public parks, a state historical building and the Birchard Public Library, which was founded in 1873 by Sardis Birchard, an uncle of President Hayes. Spiegel Grove, in Fremont, was the home of former President Hayes. The town is situated in a productive agricultural region and is surrounded by rich oil and natural gas fields. Power for manufacture is obtained by a large dam and power plant, and among the principal industrial plants are manufactories of electrocarbons, machinery, boilers and engines, farming implements, cutlery, stoves and ranges, shears, paper, underwear, beet sugar and lumber products.

A trading post, erected in 1785, and Fort Stephenson, built in 1812, first occupied the site of Fremont. Until 1850 the place was known as Lower Sandusky, but that year it was given its present name in honor of John C. Fremont.

FREM'STAD, Olive (born about 1870), a dramatic soprano and tragic actress, a prominent member of the Metropolitan Grand Opera Company, New York City. By hard, persistent effort, for she always had to earn her own living, she fought her way to the intellectual centers of the world. She was born at Stockholm, Sweden, and in her native country at the age of five appeared as a concert pianist. When she was ten years old her parents settled at Saint Peter, Minn., and later moved to Minneapolis, where she taught music and sang in choirs, putting aside her earnings to enable her to continue her studies. Hard work made a reality of her dream to complete her education in Germany, and in 1898 after three years of study she appeared in opera at the Cologne Opera House. She sang for over ten years at Munich, and then became a member of the Metropolitan Opera Company, New York. She has sung in leading cities of the United States and Canada in many notable operas, although her greatest triumphs have been achieved in Wagnerian rôles. In November, 1916, Miss Fremstad was married to Harry Lewis Brainerd, of New York City, and there she makes her home.

OLIVE FREMSTAD

FRENCH ACADEMY, or **ACADEMIE FRANÇOISE.** See Academy.

FRENCH, Alice (1850-), an American author of short stories, whose pen name is Octave Thanet. *The Bishop's Vagabond,* published in *The Atlantic Monthly* in January, 1884, forms the cornerstone of Miss French's fame. It was the author's first attempt to portray Southern character. Her style shows an unmistakable masculine tendency, and her interests are half masculine. She has an extensive knowledge of the relations between capital and labor, and her interest in the subject is possibly deeper than that of any other woman writer in the land. Her earliest work was some very heavy essays on questions of sociology. She spends a part of every summer at Cape Cod, and it was there that she acquired considerable skill in photography. *An Adventure in Photography* is illustrated by actual photographs of the adventurers, taken by the author. As she has lived in the West and in the South, her portrayals of life in those regions are very real. Among her short stories are *Otto, the Knight* and *Knitting in the Sun.* Among her later works are *The Man of the*

Hour, which has been dramatized, and *The Lion's Share.*

FRENCH, DANIEL CHESTER (1850-1912), an American sculptor, the record of whose splendid achievements, always inspired by the highest ideals in art, is unique in the history of American sculpture. He was born at Exeter, N. H., and began his career by modeling animals and birds. Louisa May Alcott early recognized his ability and became his first critic. At the age of twenty-three he completed his first important work, *The Minute Man,* for the centenary of the Battle of Concord. This was soon followed by many significant portrait statues, including those of *John Harvard* and *Lewis Cass,* and the *Gallaudet Monument* at Washington. His memorial statue of *Washington* was commissioned by the women of America and erected in Paris. *Death Staying the Hand of the Sculptor,* a memorial relief for the tomb of the sculptor Martin Milmore, in Forest Hills Cemetery, Boston, is considered his greatest work. His colossal statue of *The Republic* was one of the best pieces of sculpture at the Chicago World's Fair of 1893. These are but a few of the monumental works of this celebrated worker in the plastic arts.

FRENCH AND INDIAN WARS. The claims of the English and French settlers in North America were from the outset conflicting. Those who planted colonies on the seaboard, announced the English, had a right to all the land that stretched inland from those points; the French claimed that settlement at the source or the mouth of a river conferred a title to all territory which the river drained. Carrying out these theories, the English pressed westward from the Atlantic coast, the French southward from Canada and northward from Louisiana, and conflict was inevitable. It might have been but a colonial affair had it not been that the two countries were at swords' points in Europe as well; the most serious struggles were in Europe, and the American conflicts were really outgrowths of these. They are known as the French and Indian Wars, because the French in every case had the Indians as allies.

King William's War (1689-1697). This first struggle bears the name of the sovereign who but a year before its outbreak had come to rule in England. Its European phase was known as the WAR OF THE GRAND ALLIANCE. In America it began with the sending of French expeditions from Canada against the English frontier. Hundreds of settlers were captured or killed, sixty falling in the little town of Schenectady, but all the English expeditions against Canada except one failed almost before they started. Finally the war came to an end, not because anything had been decided, but because a treaty of peace had been signed in Europe. By this treaty the French surrendered all territory in America of which they had gained possession during the war.

Queen Anne's War (1701-1713). This was an outgrowth of the great European conflict known as the WAR OF THE SPANISH SUCCESSION (see SUCCESSION WARS), in which France had the assistance of Spain. Thus English colonists both in the North and in the South were attacked, the former by the French from Canada, the latter by the Spaniards from Florida. In the north the outstanding event was the attack on Deerfield, Mass., by the French and their Algonquin allies. Perhaps the French leaders could not control their savage helpers, perhaps they did not try; at any rate, in February, 1704, the town was sacked, fifty-three were killed and 111 made prisoners, of whom seventeen were later put to death. The English also, in 1710, took Acadia, which they rechristened Nova Scotia and have ever since continued to hold. In the South the conflict consisted of attacks on Saint Augustine by the English and counter-attacks on Charleston by the Spaniards. The Treaty of Utrecht (1713), which closed the war, ceded to England the Hudson Bay region, Newfoundland and Nova

Scotia, and allowed to it the monopoly of the slave trade in the colonies.

King George's War (1744-1748). This, too, was related to a great European conflict, the WAR OF THE AUSTRIAN SUCCESSION (see SUCCESSION WARS). Again the Spaniards were the allies of the French and Indians, and the war in the South was between the colonies of South Carolina and Florida. It was in the North, however, that the main issue was fought out. The colonial forces of New England, under William Pepperell, took the French fortress of Louisburg, on Cape Breton Island, and all the efforts of the French and Indians did not effect a recapture of it. When the Treaty of Aix-la-Chapelle was signed in 1748, however, it gave Louisburg back to France, contrary to the wishes of the New Englanders, who were proud of their conquest.

French and Indian War (1754-1760). The three conflicts described above had made almost no change in the divisions of American territory, and had left the main issues undecided. It remained for this last struggle, more specifically known as the French and Indian War, to effect a permanent settlement. In Europe this fight to the death was known as the SEVEN YEARS' WAR, and involved practically all of the great powers, while one phase of it was fought out in far-away India. In America, especially determined were the French to maintain their hold on the lands watered by the Ohio, and to these the English were equally determined to assert their claim. In 1754 the governor of Virginia sent out at the head of a small force a young man who had proved his courage and his wisdom—George Washington—and he demanded of the French that they withdraw from the contested territory. Naturally the French refused, and in the conflict which followed, the first gun of the war was fired.

Braddock's Expedition. Meanwhile, the French had erected a fort called Duquesne, at the junction of the Allegheny and Monongahela rivers, and in 1755 General Braddock was sent with a force of English regulars to dislodge them. Refusing to listen to the advice of his young subordinate, Washington, who knew the Indian methods of fighting, Braddock led his force boldly through the woods, where it was attacked from ambush and utterly defeated. Braddock was killed, but Washington succeeded in leading a part of the troops to safety. In the same year the English were unsuccessful in two other expeditions, one against Crown Point and one against Fort Niagara. One thing the British could do, however, and that was to exile from their territory of Acadia, or Nova Scotia, the French colonists whose loyalty was doubted, and it was this incident which Longfellow has portrayed so effectively in his *Evangeline.*

The English Win. Not until 1758 did the English begin to retrieve their fortunes. The new English prime minister, William Pitt, put into operation a thoroughly energetic policy, and the war was prosecuted with a vigor which soon brought it to a close. Louisburg, Fort Duquesne, Crown Point and Niagara all fell before the English; and in September, 1759, occurred the final conflict with its dramatic ending—the Battle of Quebec. Unable to take by storm the city which was held by the French under Montcalm with his 15,000 troops, the English General Wolfe began a siege, and finally led a part of his force to the Plains of Abraham above the city. The battle which followed was a turning point in American history, and has been ever since one of the events over which boy readers have loved to pore, thrilled by its records of heroism. When Quebec fell the long struggle was ended, England was to be supreme in North America. The Treaty of Paris, signed in 1763, gave to that country Canada and all the French possessions east of the Mississippi, together with the Spanish territory of Florida, while Spain received from France all of its lands west of the Mississippi, with the "Isle of Orleans," including the city of New Orleans. The only remnants of its colonial empire left to France were the tiny islands, Saint Pierre and Miquelon, south of Newfoundland, which it was allowed to keep as fishing stations on condition that they remain unfortified. England had thenceforth no rival in America but Spain. A.B.H.

Consult Parkman's *Montcalm and Wolfe;* Wood's *The Fight for Canada.*

Related Subjects. The reader is referred to the following articles in these volumes:

Paris, Treaties of	Quebec, Battle of
Pitt, William	Succession Wars

FRENCH GUIANA, *ge ah' na,* or **CAYENNE,** *ka' en,* a French colony in Northern South America which costs France over a million dollars each year to maintain as a settlement for convicts. The Atlantic Ocean washes its swampy northern shore; on the east the river Oyapock separates it from Brazil, as do ranges of the Tumac-Humac Mountains on the south. Along

the western boundary, and separating French Guiana from Dutch Guiana, flows the River Maroni, or Marowijne. With its 30,463 square miles, it is about the size of South Carolina, but it supports but 49,000 people, less than one-thirtieth of the population of that state. French Guiana is often called CAYENNE, after its capital and only port, on an island of the same name.

LOCATION MAP
The position of French Guiana in South America. The map shows the relatively small portion of the continent it occupies.

The Land and Climate. From a fertile but hot and moist coast region, subject to fever and various germ diseases, French Guiana rises into a well watered highland and mountainous region excessively rich in vegetation. Most of the country is still unexplored, however, for the diseases bred by continuous moisture make the country almost uninhabitable. At Cayenne is the only desirable harbor. Northwest of Cayenne lies Devil's Island, famous because the French artillery officer, Alfred Dreyfus, was imprisoned there (see DREYFUS, ALFRED).

Resources. Gold mining is the colony's most important industry, and gold is the chief article of export. Nevertheless, the price of labor is so high, and transportation, chiefly over poorly made footpaths, is so costly, that even that industry is not highly developed. Over two million dollars worth of gold are exported yearly. Small quantities of silver, iron and phosphate are also produced, and some marble and rosewood oil are exported, as well as sugar, rum, vanilla, pepper, cloves, cinnamon, hides, etc. The imports exceed the exports. Rice, maize, cocoa, coffee, etc., are raised, but manioc is the principal article of food. Not quite 10,000 acres of land are under cultivation.

Government and Education. The government is vested in a governor appointed at Paris, assisted by a local privy council of five members and a council-general of sixteen members. The colony is represented in the Parliament of France by one deputy. A court of first instance, a court of appeals and justices of the peace in Cayenne administer justice. About 3,000 children are instructed each year in about thirty schools. In Cayenne there are a college, a museum and an unusually complete library.

COMPARATIVE AREAS
French Guiana is 568 square miles larger than the state of Maine.

Transportation and Communication. Although steamboats ply between the capital and other towns, and a few roads connect the capital with the interior, intercourse is chiefly by footpath. A cargo boat from France visits the colony once a month, and Cayenne and Brest, France, are connected by cable.

History. In 1604 the French first settled at Cayenne, and in the years following various French companies attempted colonization, but without success. From 1654 the Dutch held the land, but twenty years later the colony passed under the control of the crown of France, and slow growth and progress followed. With a view to still further growth in 1763, 12,000 emigrants were sent to French Guiana from France. The expedition was mismanaged, however, and within two years only a handful of the colonists were still alive, and they were starving and fever-stricken. Further attempts at colonization also ended disastrously.

In 1809 the colony was captured by British and Portuguese forces, but was restored to France in 1814, after Napoleon's downfall. The boundary with Brazil, long disputed, was finally settled in 1900. The boundary with Dutch Guiana was settled in 1905. Only political offenders and criminals are now sent to the colony, and it is held by France at a financial loss. M.S.

Consult Redway's *In the Guiana Forest;* also his *Guiana.*

FRENCH IN'DO-CHI'NA, the collective name of the French possessions in the southeast of Asia, including Tongking, Annam, Laos, Cambodia, Cochin-China and Battambang. There is a combined area of 256,200 square miles, almost as large as the state of Texas and about the same size as the province of Alberta. The northern boundary adjoins

China; on the west is Siam and on the east and south is the China Sea. In 1900 the Bay of Kwang Chow Wan, with its islands and a strip of coast land, was leased by the French from China for a period of ninety-nine years and incorporated in French Indo-China.

The seat of government is at Saigon, in Cochin-China. The provinces are administered by a governor-general, appointed from Paris, with a governor in charge of each province. French influence over Indo-China commenced in the seventeenth century. Annam and Siam were visited by many missionaries, who were well received. In 1774 the king of Annam appealed to France for help against his rebellious subjects. French forces established him on his throne in 1802, and from that time French influence has steadily increased. Total population, about 18,000,000. For map, see Asia.

Related Subjects. The reader is referred to the following articles in these volumes:

Annam	Cochin-China
Cambodia	Tongking

FRENCH LANGUAGE, one of the eight Romance languages of Europe (see Romance Languages), a beautiful, harmonious tongue which is so commonly used in interstate diplomacy in Europe that no young man thinks of entering the diplomatic service without a knowledge of it. It has always ranked as the most "elegant" and "refined" of the languages, and few girls in England or America have been allowed to graduate from fashionable finishing schools without at least a superficial acquaintance with it. But this does not mean that it is in any way superficial, for few tongues surpass it in expressiveness, harmony and clearness. It is the native speech of over 40,000,000 people, for it is used in most of France, in part of Eastern Canada, and in much of Belgium and Switzerland.

History. Like all of the highly evolved languages of the world, French has had a very interesting history. The people Caesar found in Gaul at the time of his conquest spoke a rude Celtic language, the different tribes possessing different dialects. Gradually Latin took the place of the old Celtic, but this was not the classic Latin of Rome, but the so-called "vulgar tongue." This was modified still more by Celtic habits of speech and by Teutonic invaders who later conquered the country. It was not that these latter introduced many of their own words, but their half-barbarous minds refused to be bothered with any intricacies of speech, so inflections were neglected and the simpler forms used almost exclusively. The last of the Germanic invaders were the Franks, from whom the country and the language took their names.

In the ninth and tenth centuries two distinct dialects of the Romance language in France came to be recognized, one of which prevailed in the north, the other in the south. To these were applied in popular speech the quaint names of *langue d' oïl* and *langue d' oc* because the word for *yes* was *oïl* in the north and *oc* in the south. By the twelfth century one of the *oïl* dialects, the one used in the neighborhood of Paris, had gained the ascendancy, and gradually it was accepted as the classical tongue throughout the country. During the sixteenth and seventeenth centuries the standards were more definitely fixed, and by the close of that period French was practically what it is to-day—probably the clearest and most precise of modern languages.

The Study of French. Ever since educators began to awaken to the fact that there is much to be gained from the study of modern languages, French has been one of the favorite tongues for study in English-speaking countries. It is attractive because it is an "elegant" tongue, musical and refined, and therefore the "finishing schools" took it up. Then, too, it opens up one of the world's greatest literatures—a literature which has profoundly affected that of England and America; and it is the speech of a country to which travelers from England and from America go in great numbers—two very practical reasons for the study of French. Aside from these, there are cultural reasons for its study. Its nicety and precision, and the exactness with which it can express varying shades of meaning, make it a real help toward the perception of such shades of difference. It is, too, better suited than any other modern tongue to show the historical development in language, so clearly marked are the successive steps from the original Latin. In fact, so thoroughly does French fulfil all the purposes of a language that it has a number of times been proposed as a general international speech.

Certain phases of the study of French are comparatively simple. It is, for instance, far easier to learn to read than German, so simple is its sentence structure. However, learning to speak French is a different matter. Not only are many of the sounds, as the very common nasal, the peculiar *u,* the *ieu,* and others, dif-

ficult for English-speaking lips, but the very decided lack of phonetic character and the frequent silent letters make for confusion. Thus a person may easily gather from two or three years' study in school a sufficient knowledge of French to read simple prose or poetry rapidly, but only association with French-speak French so that it really sounds like the French of the Parisian. A.MC C.

FRENCH LITERATURE. The writings which, to quote William Vaughn Moody, a speaking people can give him the ability to poet with a gift for apt description, are—

> Couched in the sweet, satirical,
> Impudent tongue of France,

are among the world's greatest productions. At times French literary art has dominated Europe, and the literatures of other countries have been but imitations, more or less feeble; and while this is not the case to-day, it is not because France has deteriorated but because other countries have developed more originality. The French philosopher Buffon once said, "The style is the man," and the statement comes most fittingly from a Frenchman, for in a very real sense it may be said the French literary style is France. This does not mean that the content has been neglected, but merely that the effort has always been to make the style worthy of the content and a fit expression of the artistic, beauty-loving French people.

Two of the greatest departments of literature are the epic and the tragedy, and in these France has not excelled. No great epic of the literary type (see Epic) and but few really great tragedies have been produced by Frenchmen, but of exquisitely funny comedies, of charming musical verse, of novels that are beyond criticism, of polished essays, of short stories that are models of what the short story should be, France has contributed liberally to the world's literature. A detailed treatment of French literature throughout its long course is impossible in this article, which must serve rather to bind together the numerous biographies of French writers which are included in these volumes. Most of the authors here named are treated in a separate article, as well as many others, whose names will be found listed in the indexes, under the articles Drama; History; Novel; Poetry.

Early Stage. After the French language had been evolved from the Latin, the first literary productions were the so-called *chansons de geste,* or *songs of deeds.* These were folk epics which centered about the careers of great national heroes, chief among whom were Charlemagne and Arthur. Most famous of the Charlemagne cycle is the *Song of Roland,* which holds in French literature somewhat the place which the *Nibelungenlied* occupies in German or the *Cid* poems in Spanish. Out of the Arthur cycle have grown all those legends and poems so familiar to English readers, which treat of the Round Table.

During the Middle Ages—that is, from about 1100 to about 1400—the *troubadours* (which see) attained wide popularity and influence in the south of France, while in the north the *trouvères* found enthusiastic audiences for their love songs. In France, as in most countries, poetry grew up first, and prose had a slow development. The first form of prose which appeared was history, represented by the famous *Chronicles* of Froissart. Meanwhile, an intense interest in the stage was developing, and mystery plays were produced in great numbers and with much elaborateness. It was nothing unusual for a village to devote several days to a single religious drama.

The Golden Age. All of this was largely preliminary, and not until the sixteenth century did any really great figure stand out in French literature. Then appeared Rabelais, who with his good sense and "Homeric laughter" helped on that intellectual awakening which is known as the *Renaissance.* The Reformation in France is typified by Calvin, while the spirit of skepticism which grew out of the new questioning attitude found its best spokesman in Montaigne. The real Golden Age of French literature was the seventeenth century, and as the names of Molière, Corneille and Racine testify, the drama was supreme. The first-named of the trio is looked upon as the greatest laughter-maker the world has produced, with the exception of Shakespeare, while the others brought tragedy to a height which it has never since attained in France.

Not all the great writers of this period were dramatists. Lafontaine wrote his matchless fables, the only modern fables worthy to rank with those ancient ones credited to Aesop; Boileau, with his satires and criticisms, ruled literary France; Madame de Sévigné set a high standard for letter-writing; Fenelon produced a famous romance; and—of more interest to the children than are all the others together—Charles Perrault gave to the world the immortal *Mother Goose Stories,* which

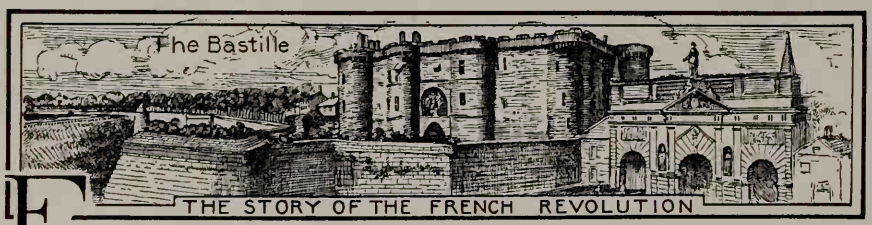
contained *Cinderella,* the *Sleeping Beauty, Puss in Boots, Tom Thumb* and other favorites. See MOTHER GOOSE.

From the Eighteenth Century to the Present. The eighteenth century was far below the seventeenth in the quality and amount of literary achievement. During the first half there was very little that could pretend to originality, while later in the century, when there arose writers of undoubted power and individuality, all France was so engaged with social and political problems that little save propaganda literature was demanded or produced. If one man were to be chosen to represent the century, that man would undoubtedly be Voltaire, and Voltaire's works were destructive rather than constructive. The current religion, the current philosophy, he attacked fiercely, and by his stirring up of the questioning spirit he did much to bring on that great outbreak which he did not live to see—the French Revolution. Even more influential in this direction was Rousseau, who, as one writer says, "provided most of the ideas which the Revolution tried to put in practice." Other outstanding writers of the eighteenth century were Montesquieu, who wrote on the philosophy of history; Le Sage, damatist and novelist; and Beaumarchais, the most important dramatic writer of the century in France.

The most significant literary movement of the nineteenth century was that toward freedom of literary form—the movement known as *Romanticism.* Chateaubriand, perhaps unconsciously, began it, but it reached its culmination in the works of Victor Hugo. As always, the tendency toward romanticism was carried too far, and the real merits of the movement were obscured by exaggerations, so that as a movement it had only a brief life, but it left its permanent impress on literature, lessening the formal restraints of classicism and imparting a new note of naturalness.

The French writers of note in the nineteenth century are numerous, and include Lamartine, Gautier, Sainte-Beuve, Musset, George Sand, Dumas (father and son), Balzac, Daudet, Zola and Maupassant. Each of these was preëminent in one or more ways. Balzac, for instance, is accounted by some critics the world's greatest novelist, while to Maupassant is conceded almost universally the honor of having produced the very finest short stories ever written; but Hugo towers above them all by reason of his versatility and his power to draw characters that live in men's minds. Though fiction in one form or another was perhaps the dominant literary type in the nineteenth century, other departments were well represented. Sardou, Rostand and Anatole France produced plays that acquired wide popularity, and Renan and Taine wrote histories that were epoch-making in their methods. The literary future of France looked very bright during the early years of the twentieth century, but with the outbreak of the War of the Nations in 1914 there was practically a cessation of productions, excepting those of a controversial character.

A.MC C.



THE STORY OF THE FRENCH REVOLUTION

FRENCH REVOLU'TION, one of the greatest internal struggles that ever rent any nation. The motto of its leaders was "Liberty, Equality, Fraternity" and if at the close it seemed that these had not been achieved (for the same reactionary Bourbon house again held the throne), the results were still very real and very lasting. In the broadest sense the Revolution may be looked upon as extending from 1789 to 1815, the date of Napoleon's overthrow in the Battle of Waterloo, but this article treats only of the first ten years of that period, leaving the latter part to be considered in the article NAPOLEON I. The causes, too, are passed over here, but are fully discussed under FRANCE, subtitle *History.*

The Outbreak. Even Louis XVI, of the House of Bourbons who "forgot nothing and learned nothing," had become convinced that only the States-General, the legislative branch,

for more than a century and a half unsummoned, could deal with the critical questions that had arisen. In 1789, therefore, that body was called together and this very act was an acknowledgment that the sovereign of France was not absolute. But the States-General, before it could attack the waiting problems, had to settle its own method of voting. In the olden days the vote had been taken by classes, the nobles having one vote, the clergy one and the third estate, or commons, one, but it was evident to the third estate that if this plan were followed the two other orders could thwart every effort for reform. When the nobles and clergy refused to consider voting by poll the third estate withdrew and declared that they were the National Assembly, and that anyone who wished a voice in affairs must join himself to them. This the clergy did in large numbers, for many of them had sympathized with the lower classes in their downtrodden state, and gradually certain of the nobles added themselves to the number. This new Assembly, which was to meet as a single body, one man's vote counting for as much as any other, was known as the *Constituent Assembly.*

Measures of the Constituent Assembly. The task which this body had set for itself was the adoption of a constitution. Naturally enough, two tendencies showed themselves in it. Some members merely wanted reforms in government—regular meetings of the States-General and a lessening of taxation—but others wanted far more sweeping changes. The privileges of the nobles must be taken away, they demanded, and the king must admit the right of the people to a voice in the government; and as the demands of this latter class became more and more radical, the moderate element proved unable to restrain them. The Revolution thus was launched.

It happened that the Minister of Finance, Necker, was very popular with the people. When, in July, 1789, the king dismissed him, the people rose in open insurrection and stormed the Bastille, the great, gloomy prison which stood as the symbol of the tyranny of the upper classes. Necker was recalled, but it was too late for him to stem the tide. In order that riot might not go unchecked, the National Guard was organized; and many of the nobles, with the "great fear" upon them, left France, the first of the *émigrés.* Meanwhile, the Constituent Assembly declared all feudal rights and privileges abolished, and published flaming articles on the rights of man. In October, 1789, a mob, mostly women, rushed to Versailles, killed the royal guard and compelled the king and queen to return to Paris, whither the Constituent Assembly also removed. One of its popular acts at the time was the abolition of all titles of nobility.

In July, 1790, the new constitution was proclaimed and the king took oath to support it. The people distrusted him, however, and constantly suspected the exiled nobles of attempting to gain the aid of foreign powers against the Revolution, as indeed they were doing. Disregarding the advice of Mirabeau, the clearest headed man whom this first phase of the struggle produced, the king and queen tried, in June, 1791, to escape from France into Austria, but were captured and brought back, now more deeply under suspicion than ever before. A new constitution having been submitted to the king, the Constituent Assembly dissolved itself in September, 1791, and the Legislative Assembly took its place.

War Declared. Torn with dissensions within, France especially needed peace, that some stable form of government might be established, but in April, 1792, the Legislative Assembly hurried the country into war with Austria and Prussia. As always, lack of unity and discipline at home reacted on the army, and news of defeats drove the mob in Paris to frenzy. A band of rioters in August, 1792, broke into the Tuileries, put to death the king's guard and left Louis no alternative save to throw himself on the mercy of the Legislative Assembly. That body, still at the demand of the mob, suspended him from his royal office and imprisoned him with his family in the Temple. Further news of defeat led to further mob violence, and in September, 1792, no fewer than 1,000 royalists were slain in the prisons of Paris. On September 20, however, the tide turned. Victory in the Battle of Valmy fell to the French, and the Paris mob was for a time placated.

Republic Proclaimed; King Executed. On that same day, September 20, a new governing body, the National Convention, met, and for a time the military successes continued under its direction. So confident did the French become that they declared their intention of annexing Belgium and Savoy, and thus they made for themselves new enemies among the European powers. But an event soon occurred in France which stirred up still greater opposition among the outside nations. Not

content with declaring France a republic, the Convention in December, 1792, brought the unfortunate king to trial, and early in the next year he was beheaded. So while the nations of Europe were becoming more and more united against France, disunion was growing within the country. In the Convention two parties, the moderate Girondists and the radical Jacobins, contended for supremacy, the latter gaining step by step until by June, 1793, they were strong enough to expel the leaders of the Girondists and put them under arrest.

Reign of Terror. With the rise to power of the extreme Jacobins the Revolution entered upon its most terrible stage—the so-called Reign of Terror. The virtual dictators of the nation were the Committee of Public Safety, composed of the most radical members of the Convention, under the leadership of Danton (which see). It must not be assumed that this Committee performed its dreadful work merely because it was bloodthirsty; if France were to be saved from the aggression of outside nations, all wavering must cease, all theorists and mere orators must be removed from control of affairs, and death could secure the only safe and sure method of removal. Marie Antoinette, Philip Egalite, of the House of Orleans, Madame Roland—these were but a few of the hundreds upon hundreds of victims who were sent to the guillotine because they had aroused the suspicion of some member of the Committee. Actual guilt was not necessary, for the trials were but mock affairs. Paris became accustomed to the sound of the carts as they lumbered through the streets, carrying people, distinguished or insignificant, all on their way to one common fate. Round about the guillotine gathered the terrible "knitting women" of whom Dickens tells in his *Tale of Two Cities*, who stopped in their counting of stitches only long enough to check up the heads as they fell.

Every phase of the Revolution had its leader, and the leader of this stage was Robespierre. If a man were too radical in his demands, as was Hébert, at the will of Robespierre he was sent to the guillotine, with his followers; if a man were not radical enough, and ventured to suggest that the Terror was passing all bounds, as did Danton, he, too, was put out of the way. However, he who ruled by the Terror was to perish by the Terror, and in July, 1794, a plot against Robespierre succeeded and he was beheaded. With his death ended the Reign of Terror.

The Rise of Bonaparte. Now moderation came to the fore. The Girondists who had been expelled from the Convention were brought back, the Jacobin Club was closed, and in 1795 a new constitution, drawn up by the Convention, established a new government. This consisted of a Directory of five persons, and two legislative houses, the Council of Ancients and the Council of Five Hundred. However, Paris was not disposed to accept this constitution quietly, and in October a violent mob-outbreak occurred. With the quelling of this a young Corsican, Napoleon Bonaparte, had much to do, and from this time on he was one of the most prominent figures in France, gradually becoming the dominant man of the world.

During the latter part of the Convention government France's arms had been fortunate abroad, and under the Directory these successes bade fair to continue. Bonaparte won victories in Italy and other generals held back the Austrians, but conditions changed when Bonaparte went to Egypt. Then Austrian armies invaded Italy and several times defeated the French, while England and Russia renewed their aggressions. The Directory was no better able to cope with conditions at home. Financial affairs were hopelessly involved, and the general weakness of the government was all too apparent. A strong central government was what France needed, and wanted; and there was considerable talk of restoring the monarchy; but some of the wisest men of the time saw that there was another solution possible, and that the "Little Corsican" then absent in Egypt was the only man who could furnish it. At their invitation Bonaparte returned to Paris, overthrew the Directory and put himself at the head of affairs. For the next fifteen years the history of France was the history of Napoleon—all the threads of the Revolution had met in him. How he used his opportunity the article on NAPOLEON I makes clear. E.D.F.

Consult Farmer's *Short History of the French Revolution*. A great novel which deals with the subject is Dickens' *Tale of Two Cities*.

Related Subjects. The Revolution and history of the period will be better understood by reference to the following articles.

Bastille	Mirabeau
Émigrés	Napoleon I
France, *History*	Robespierre
Girondists	Roland de la Platière
Jacobins	States-General
Louis XVI	Tuileries
Marie Antoinette	Versailles

FRENCH SOMALILAND, *so mah' le land,* a French possession at the entrance to the Red Sea, in Northeast Africa. It covers an area of about 5,790 square miles, and is therefore nearly as large as Rhode Island and Connecticut combined. The interior consists of a series of dry tablelands rising to a height of about 4,000 feet. The rivers, dry water courses late in the summer, become raging torrents for a short time during the rainy season in May and June. In some parts the soil is fertile and produces good crops of millet and other grains. Exports consist chiefly of coffee, hides, ivory, gum, mother-of-pearl and small quantities of gold. The most important industries are turtle and mother-of-pearl fisheries. There is only one good harbor, at Jibuti, the seat of government and terminus of a railway running through the colony into Abyssinia. Other towns of importance are Obok, the former capital, Ambado, and Tajurah.

FRENCH SOMALILAND

The colony is administered by a governor sent from France, and a council of six members. The inhabitants are of mixed nationalities, including Somalis, Indians, Arabs, Abyssinians and about 2,000 Europeans. In 1883, when there was considerable rivalry between France and England with regard to African possessions, the French annexed this colony. Treaties with England and Italy, whose colony of Eritrea forms part of the northern boundary, have clearly defined the limits of the French territory. Population in 1910, about 208,000.

FRENCHTOWN, Battle of. See Raisin River, Massacre of.

FRESCO, *fres' ko,* or **FRESCO PAINTING.** The term *fresco,* which is the Italian for *fresh,* is applied to a painting executed in water color on fresh plaster. Before beginning his work the artist usually makes a drawing of his subject in black and white, called a cartoon, which is exactly the size of the intended picture. A smaller-sized sketch is also prepared in colors, to use as a reference as the work proceeds. Enough fresh plaster for a day's work is laid on the surface to be decorated and the cartoon is then placed on the plaster, the outlines of the picture being traced in it by means of a dull-pointed instrument made of wood or bone.

The artist then proceeds with the painting, working as rapidly as possible. As fresco cannot be retouched successfully after the plaster is dry, a portion of the picture once commenced must be completed almost at once. When the day's work is ended, the artist removes any unpainted part of the plaster, cutting it neatly along the finished edge of the picture, so that the joining of the plaster for the next day's work may be concealed. The coloring in fresco painting is notably clear and pure, but it is lacking in richness and depth.

Fresco painting reached a high state of development in Italy in the fourteenth, fifteenth and sixteenth centuries. Among the most celebrated frescoes of that period are the decorations of the Sistine Chapel in the Vatican, by Michelangelo. His painting of *The Last Judgment,* which covers the entire altar wall, is the largest fresco in the world. Michelangelo also executed two large frescoes for the Pauline Chapel—*The Conversion of Saint Peter* and *The Crucifixion of Peter.* Several rooms of the Vatican are beautified by fresco paintings executed by Raphael, and the frescoes in the Church of San Marco, in Florence, by Fra Angelico, are also famous.

THE "ANNUNCIATION"
A fresco in the Convent of San Marco, Florence, executed by Giovanni Angelico.

Fresco painting was revived in the nineteenth century by the German artist Peter von Cornelius, whose decorations in the Church of Ludwig, in Munich, are the most important frescoes of modern times. Through his influence the new Houses of Parliament, London, were decorated with this form of painting.

A special kind of fresco painting, called *fresco seeco,* is employed in house decorations. In this process the colors are laid on the walls after the plaster is dry. Before the work is begun the dry plaster is rubbed with pumice stone for the purpose of removing the crust, and it is then washed with water mixed with a little lime. Such decorations have neither the permanence nor the delicacy of true frescoes. R.D.M.

FRESNO, *frez'no,* CAL., a prosperous grain and stock market, and the county seat of Fresno County, situated in the fertile San Joaquin Valley, in the central part of the state, 208 miles southeast of San Francisco. It is on the Southern Pacific and the Atchison, Topeka & Santa Fe railroads. In 1910 the population was 24,892; in 1916 it was 34,958, by Federal estimate. The area of the city is about five square miles.

Fresno is the shipping point for an important agricultural and stock-raising section. The principal exports include raisins, which are grown extensively, and raisin products, grapes, oranges, olives and other fruits, including Smyrna figs, and wheat, sheep and horses. Near the city is Kearney Park, an irrigated experimental farm owned by the University of California. Fresno is in a rich petroleum field and possesses several important industrial establishments. These include an oil refinery, fruit-packing plants, icing plants, a cooperage, planing and flour mills, a macaroni factory and fruit-drying establishments.

Among the more prominent public buildings are the Federal building, erected at a cost of $250,000, the courthouse, city hall and Carnegie Library. A short distance east of the city is King's River Cañon, southeast is the Sequoia National Park, and forty miles south is Tulare Lake. Fresno was settled in 1872, became the county seat two years later and received a city charter in 1885.

FREUD, *froit,* AND FREUDIAN VIEWS. See SUBCONSCIOUS.

FREY, *fray,* one of the most celebrated of the gods in Norse mythology, was the son of the sea god Njörd, and brother to Freyja, the goddess of love. He presided over the rain and sunshine as well as all the fruits of the earth. At sacrificial feasts the Norsemen and their guests filled their horns and prayed to him for a prosperous season and for peace.

Frey was an especial favorite of the other gods, who presented him with gifts which figure prominently in Norse mythology, among them a magic sword which would fight by itself the moment it was drawn from its scabbard; a ship which, while large enough to carry all of the gods and their attendants, at will could be folded up and tucked into a pocket; and a boar with golden bristles, which enabled Frey to ride over land and sea with incredible swiftness. Frey fell in love with Gerda, the daughter of the giant Gymer, and in order to gain the assistance of his servant in winning the lovely maiden for his bride, Frey was obliged to part with his wonderful sword, which was afterward greatly needed by the gods in all their combats. Frey was worshiped extensively throughout the Northern countries; in fact, in some provinces of Sweden the people at an early day put their highest trust in him and even believed that at times he appeared in human form.

FREYJA, *fra'yah,* in Norse mythology, the goddess of love and beauty, and the sister of Frey (which see). Although she corresponds to Venus of Greek mythology, the conception of her differs somewhat, as Freyja is regarded to some extent as a war goddess, and often accompanied the valkyries when they flew down to the battlefields to carry away the slain warriors (see VALKYRIE). She always asserted her right to one-half of the slain, the other half belonging to Odin, the god who represented the spirit of life. The warriors afterwards were carried to her palace and there entertained sumptuously.

Freyja married a god named Oder, who deserted her in order to travel into remote countries; from the day of her desertion she wept continuously, and her tears were drops of gold. She is, therefore, called the fair, weeping goddess. In Norse poetry, gold is called "Freyja's tears" and "the rain of Freyja's brows or cheeks." Freyja's cats, which drew the chariot wherein she traveled in quest of her husband, symbolize sly fondling and sensual enjoyment. The name of her husband, Oder, signifies wild desire. The diversified names bestowed upon Freyja in her journeyings to the various countries visited denote the various modes by which love reveals itself in human life.

FRI'AR, a general name applied to a member of a comparatively recent religious Order to distinguish him from a member of an older community of *monks.* The latter title applies especially to the Benedictines and their branches, and is incorrectly applied to the mendicant Orders. The founders of the Do-

minicans and Franciscans, inspired by humility, designated their followers by the simple title of *brother*. Saint Francis called his disciples *friars minor,* or lesser brothers, while Saint Dominic termed his Order the *preaching friars*. The popular English names of these Orders, derived from the distinguishing characteristics of their habits, are preserved to the present time in the names of English streets and localities. Examples of these are *gray friars* (Franciscans), *black friars* (Dominicans), *white friars* (Carmelites), *Austin friars* (Augustinians), etc. See MONK; MONASTICISM.

FRICTION, *frik'shun,* a word derived from the Latin *fricare,* meaning *to rub,* is applied in physics to the resistance which one body offers to another when dragged or pushed across its surface. If two objects with flat surfaces are placed one on top of the other so that their surfaces are in close contact the topmost object may be lifted without resistance except that of gravity. If, however, an attempt is made to push the topmost object along the surface of the other, friction occurs.

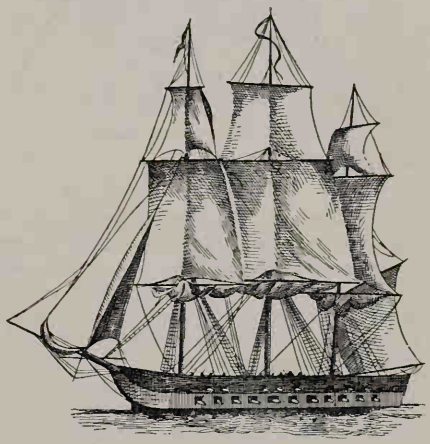
Friction is greater between rough than between smooth surfaces. It is friction that makes the wheels of a locomotive grip the rails of the track; it causes an endless belt to turn the wheels over which it is placed. Without friction few motions would be possible, and trains would have to be run by machinery consisting chiefly of cogwheels. Unevenness of surfaces causes friction and loss and energy in machinery, and leads to the use of oil to fill the spaces so that the surfaces will move upon each other the more readily.

FRI'DAY, the sixth day of the week, derived from the German word *freitag,* which means *day of Freya.* Freya, or Freyja, who was the goddess of love in Norse mythology, was driven in a beautiful chariot, drawn by cats, and liked music, spring and flowers. One thing known concerning the very ancient Scandinavians is that they considered Friday their "luckiest" day, but, since the crucifixion of Christ on that day, many people regard it with superstitious dread. In the Roman Catholic, Anglican and Greek churches, Fridays, except when they fall on Christmas, are observed as days of fast in memory of the crucifixion, while the Friday before Easter, called Good Friday, is observed quite generally among Christians as the day of the Passion. Among the Mohammedans it is the day for religious gatherings, chosen as the day on which Adam was created and as the day of Resurrection. From its association with the crucifixion, it is considered the proper day to set for the execution of criminals and as such is sometimes called hangman's day. See FREYJA.

FRIEND'LY ISLANDS, the name given by Captain Cook, the discoverer, to the Tonga Islands (which see).

FRIENDS, SOCIETY OF. See QUAKERS.

FRIG'ATE, a former type of war vessel which was larger than a sloop and smaller than a battleship. The term was first applied to fast-sailing merchant vessels which were hired in the sixteenth century for service with the



A FRIGATE

A type of the most popular style of vessel prior to the period of the War of Secession.

English navy. The first frigate built as a war vessel was the *Constant Warwick* which, in 1677, became part of the navy and carried forty-two guns. In the eighteenth century frigates were regarded as the best type of fighting ships. The English vessels had a tonnage of from 500 to 1,200, while some of those built for the United States navy were larger. Frigates carried three masts and were known as "full-rigged ships." The most famous frigate of the United States navy was the *Constitution,* launched October 21, 1797 (see CONSTITUTION). The introduction of ironclad vessels caused the building of frigates to be completely abandoned. "Cruisers" now occupy the position in the navy formerly taken by frigates. See WARSHIP.

FRIGATE BIRD, or **MAN-OF-WAR BIRD,** a bird of prey, which, on account of its immense extent of wing and its dashing habits,

has been called the swiftest bird that sweeps the seas. *Man-of-war bird* is the older name for the *Fregata,* but it is less distinguishing, some of the large albatrosses being so called

THE FRIGATE BIRD

(see ALBATROSS). The frigate bird is a tropical sea-bird of two species; the larger ranges all round the world within the tropics; the smaller is found only near the Eastern seas from Madagascar to Moluccas and southward to Australia. Both species breed in large colonies, and build their nests on rocks, high cliffs or lofty trees on uninhabited islands. The upper plumage is dark brown, with a metallic gloss; the females have pink feet; the males, black. The male acquires under its bill a bright scarlet pouch which is capable of inflation.

FRIGGA, *frig'gah,* or **FRIGG,** a goddess in Norse mythology, the wife of the god Odin, who represented the spirit of life and permeated the whole universe. In some respects Frigga corresponds to Juno, in classical mythology. She was also known to other Teutonic peoples, both on the Continent and in England, where her name still survives in the word Friday. Very often she is wrongly identified with Freyja, who might be compared more fitly with Venus. Frigga typifies a mother's love; Freyja, the love of youth. Frigga knows the fate of all men, but she neither says nor prophesies anything about it herself. See ODIN; FREYJA.

FRINGE TREE, a slender, narrow-topped tree, twenty to thirty feet high, which blossoms in May and June and produces delicately fragrant, fringelike flowers of dainty beauty. It is found from Southern Pennsylvania to Florida and west to Arkansas and Texas. In Southern Europe it is highly prized as a beautiful exotic (not native) specimen from America. A species found in China has flowers with shorter, broader petals, but in grace and beauty it cannot compare with the American variety.

FRO'BISHER, SIR MARTIN (1535-1594), the first English navigator to search for a northwest passage to India. He was a friend and companion of Drake and Hawkins, and one of the greatest seamen of the days of Queen Elizabeth. Frobisher made three unsuccessful attempts to reach India by sailing westward, but proceeded little farther than the south of Greenland. He later conducted many expeditions against Spain, and was knighted for his services against the great Armada in 1588 (see ARMADA). After raiding many towns on the Spanish coast, he died from the effects of a wound received while attacking Brest.

FROEBEL *freb'el,* FRIEDRICH WILHELM AUGUST (1782-1852), a German educator and child-lover, the founder of the kindergarten (which see). In Thuringia, where he was born, the name *Froebel* is to be seen carved in huge letters in the cliffs of a mountain pass; and just as deeply is his name engraved on much that is best in modern education. This man who did so much to make other children happy had himself a childhood that was far from happy. Not long after he was born, on April 21, 1782, at Oberweissbach in Thuringia, his mother died, and his father, a Lutheran pastor, neglected him sadly. The stepmother who came to preside over the home when the child was four years of age proved the typical stepmother of the fairy tales, and her harshness caused the quiet, dreamy child to withdraw more and more into himself. In after years it was probably the memory of what he wished for in those early days that gave him so true an understanding of the child heart.

FRIEDRICH FROEBEL

When he was ten he went to live with an uncle and in his school life was fairly happy, though the teachers never understood him and considered him little better than a dunce.

Apprenticed in 1797 to a forester, he roamed the Thuringian woods, acquiring a knowledge of nature that tinged all his life work. Later he studied architecture, and only on the insistence of a schoolmaster friend did he turn his attention to teaching. At once he showed his wonderful fitness for the work, but even his association with Pestalozzi, whom he frequently visited, did not convince him that he had really found his life work. In 1813 he was drawn into the wars with Napoleon, which were engaging all Europe, and saw active service against the French. By the time the struggle was over he had become convinced that education was the one subject vital enough to claim all his energy.

In 1816, two years before his marriage, he founded at Griesheim a school to which he gave the sounding title of Universal German Educational Institute. Through the next twenty years, though he taught steadily and conscientiously, he was far from satisfied with his progress, feeling that the method was wrong from the start; but in 1836 he hit upon what he called a "definite truth"—an inspiration which led to the founding of the first kindergarten. [A name puzzled him for some time, but when *kindergarten* flashed across his mind it fully satisfied him.] His first kindergarten (child garden) was opened at Blankenburg, and after 1850 he lived and worked at Marienthal, where he died on June 21, 1852. It seems strange that in his own day he encountered fierce opposition, and that in 1851 a law was passed in Prussia forbidding the founding of kindergartens. From his own point of view his life work must have seemed a failure, but the best estimate of succeeding times is given in the vast number of kindergartens which exist in every civilized country. Educators do not hesitate to declare that the kindergarten was among the greatest educational developments of the nineteenth century, and that Froebel was one of the greatest educators.

The chief principles of Froebel's educational creed, briefly stated, were that the education of a child should begin at its birth; that it should be conducted by the natural method—by the developing of impulses that come from within the child; that the most can be accomplished if the child is kept happy in his work and allowed to follow the lines of his own interests; and that training should be threefold, touching the physical, mental and spiritual sides of the child's nature. See KINDERGARTEN.

The following books will be found helpful to those who wish to study Froebel's life and work in more detail: His *Autobiography;* Blow's *Letters to a Mother on the Philosophy of Froebel;* Bowen's *Memoir* in the *Great Educators Series;* Hanschmann's *Life of Froebel;* White's *Educational Ideals of Froebel.*

FROG, a little, cold-blooded, tailless animal common in all parts of the world except Australia, though rare in South America. The chorus of frogs and their relatives, the toads (see TOAD), starts soon after the ice of ponds

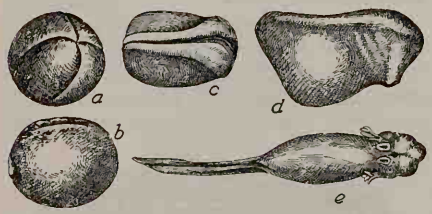
"When by night the frogs are croaking, kindle
but a torch's fire;
Ha! how soon they all are silent!"

begins to thaw and when pussy-willows are gray. It lasts throughout the summer and until once again cool weather heralds the approach of winter's ice and cold.

Among the hundreds of nature's wonders in the vegetable and animal life in swampy places and along the shores of lakes and streams, the life of a frog is one of the most interesting In early spring, the mother frog lays masses of tiny eggs, velvety black above, creamy white beneath. So small are they that a mass of five or six thousand would measure only about five inches in diameter and two and a half inches thick. About the eggs a jellylike substance is secreted, and then away on the waters they float and within a few hours begin to develop.

After wonderful growth and change, within nine days the tiny black specks have changed into queer little water animals, called tadpoles, or pollywogs. They are not at all like the parent frogs. They have neither mouths nor limbs, but have branching gills and long tails with which they swim. Their bodies look like roundish lumps of dark jelly. Soon the mouth develops, gills disappear and finally hind legs begin to grow. Then come front legs and teeth and lungs, and the animals rise to the surface to breathe. The tails then drop away, and at last, within two or three months, there is a family of smooth-skinned frogs, keen of sight and hearing, fine swimmers and wonderful jumpers.

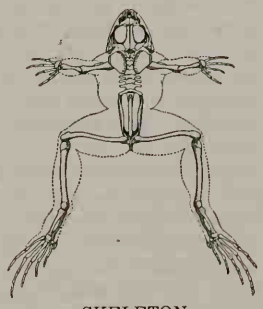
A frog does not attain full growth for three or four years, however, and it is supposed to live ten or fifteen years. Tadpoles live chiefly on vegetable matter, but grown frogs live on insects, slugs, snails, etc. Most frogs live on



FIRST STEPS IN DEVELOPMENT

(*a*) Egg, drawn to show first two vertical grooves corresponding to two partitions which divide the egg into four cells. (*b*) Afternoon of third day; egg as seen from right side. (*c*) Next day; folds are closing in over grooves, to form the nerve tube. The front of this tube will form the brain, and the remainder will be the spinal cord. (*d*) Afternoon of fifth day; embryo in same position as *b* and *c*, though more fully developed. (*e*) Tadpole just hatched.

both land and water and are therefore amphibious. The tree-frog lives almost wholly on land. Like toads, frogs frequently change their skins, and they eat their old suit of clothing while pulling it off over their heads. They also change color, somewhat to match their surroundings, from the green of lily pads to a duller shade nearer the brown of fallen leaves. Toads differ from frogs in having no teeth, being broader, flatter and darker, and in having larger eyes and a warty, more poisonous skin. The best known frog in America is the bullfrog; other species are the green spring-frog, the leopard-frog, the wood-frog and the edible frog.



SKELETON

Frogs are not only relished by fish and birds, but man, both civilized and savage, in addition to using them as bait in fishing, regards them as choice food. In France they are so highly-prized they are bred for the market in large quantities. In America both the bullfrog and the spring-frog are sold. Only the hind legs are eaten in America and in France, and they are usually served fried. In Germany all muscular parts are stewed. V.L.K.

FROHMAN, *fro'man,* CHARLES (1860-1915) and DANIEL (1853-), theatrical managers, members of the theatrical syndicate organized in New York in 1895. Both brothers were born in Sandusky, Ohio. The elder, Daniel, began his business career in a newspaper office, where he worked for five years. Subsequently he became manager of a traveling theatrical company, and since then has managed many New York theaters and theatrical companies, including the Lyceum Theater, Daly's and the Daniel Frohman Stock Company.

Charles Frohman has been called the "theatrical Napoleon" of America. Although given little early education and ignorant of the theory of dramatic art, he instructed many accomplished actors in the proper methods of reading their lines. He advanced Maude Adams to the place which she holds to-day, and was instrumental in bringing forward a great many well-known American actors. After managing several road companies he obtained control of the Criterion, the Museum, the Garrick, the Savoy, the Madison Square, the Knickerbocker, and the Garden Theater in New York City, besides the Duke of York Theater in London. In 1895 he organized the syndicate of which he was the head. During one typical season he put on twenty-five stage productions, employed 795 actors, and paid out salaries amounting to over $25,000 a week. Up to the close of the season of 1912 he had produced more than 600 plays.

He lost his life in the *Lusitania* disaster, on May 7, 1915. His last known words, spoken on the deck of the sinking ship, have become famous: "Why fear death? It is the most beautiful adventure that life gives us!"

FROISSART, *frwah sahr',* or *froi'sart,* SIR JEAN (about 1338-1410?), a courtly poet and historian of the time of Edward III. As one editor remarked, "Froissart's whole business was to live in the fourteenth century, and tell us what he saw there." His name stands for chivalrous adventure in the minds of all readers of history. His most famous work is the *Chronicles,* four volumes of vigorous, picturesque tales of the wars and other events of his century. In the poem *L'Espinette Amoureuse* he has given an account of his school days and early love affairs. He studied for the ministry, but his inclinations were always toward writing stories and poems of chivalry and adventure. In 1361 he went to England to present one of his books to Queen Philippa, and spent five years in the English Court as sec-

retary to the queen. He was at Bordeaux on Twelfth Night, 1367, when Richard, the son of the Black Prince, was born; and he was bidden to write down the fact for his book of *Chronicles*. When Queen Philippa died in 1369, Froissart went back to his own country of Hainault, where he worked diligently on his *Chronicles*. Not much is known of the last years of his life, and the date of his death is uncertain.

FRONDE, *froNd,* a French word meaning *sling,* the name given to the period of civil strife in France during the minority of Louis XIV, from 1648 to 1653, and also applied to the aggressive faction concerned in that struggle. The conflict was called the "War of the Fronde," or of the "Slingers," a contemptuous reference to the common use of the sling among the urchins of Paris. The movement originated with the opposition of the Parliament of Paris to the tyrannous measures of Mazarin, the Prime Minister (see MAZARIN). In the insurrection which followed, the forces of the Parliament were overruled by the Prince of Condé, acting for the court party. Later Condé quarreled with Mazarin, who arrested him. This action aroused the nobles and led to the Prime Minister's exile. Soon after when Louis XIV came of age, he recalled Mazarin and placed Turenne at the head of the army. Condé was defeated near Paris in 1652, which conquest led to the final victory of the court party and of Mazarin.

FRONTENAC, *froN te nak',* COMTE LOUIS (1620-1698), an able, energetic, farseeing governor of New France, the name applied to the early French possessions in North America. He, together with Champlain and LaSalle, formed the trio which established the French power in America. It was Frontenac, more than any other man, who placed it on such a firm basis that it survived his death for three-fourths of a century.

When Frontenac was appointed governor of New France in 1672 he was already in middle life. As a mere boy he had become a soldier, at twenty-three he was a colonel, and at twenty-six he was a brigadier-general. He saw active service in Flanders, Germany and Italy. His military habits, his occasional arbitrary commands and his frequent outbursts of temper involved him in difficulties with the civil authorities of the province in America after he became governor. He was tactful and masterful by turns in his dealings with the Indians, and the colony as a whole prospered under his rule. He encouraged exploration of the West, and his aid stimulated LaSalle, Joliet and Marquette. Meanwhile he quarreled incessantly with the *intendant,* or treasurer, of the province, and with the priests, until finally, in 1682, he was recalled to France.

An interval of only seven years was enough to prove that New France needed Frontenac's iron rule, and in 1689 Louis XIV reappointed him as governor. It was the ultimate aim of the French to drive the English out of North America, or at least to restrict them to a narrow strip along the Atlantic Ocean. Frontenac at once began vigorous campaigns against the Iroquois, who were being encouraged and aided in their attacks on New France by the English. The New York and New England frontier became the scene of a cruel warfare. Frontenac's bands of French and Algonquins burned and plundered, but were unable to make permanent conquests. In 1690 Frontenac defended Quebec against an English fleet, and in 1696 he finally compelled the Iroquois Indians to sue for peace. The Treaty of Ryswik (1697), which put a temporary stop to the war, was followed in less than a year by the death of Frontenac.

FROST, a beautiful formation of ice which bestows on bare and unsightly trees magic garments of sparkling crystal, and traces on the windowpane patterns as lovely as the most delicate filigree work. The work of "Jack Frost" is described in an old-fashioned poem that many a child has memorized:

He went to the windows of those who slept,
And over the pane like a fairy crept;
Wherever he breathed, wherever he stepped,
By the light of the Moon were seen
Most beautiful things; there were flowers and trees,
There were bevies of birds, and swarms of bees,
There were cities with temples and towers, and these
All pictured in silver sheen.

Frost is the moisture always found in the air, condensed on vegetation and other objects when the temperature falls below the freezing point, 32° F. During the daytime the earth absorbs much heat from the sun's rays; this heat it gives up again as soon as the sun sets. On the rapidly-cooling surface of the earth, the moisture in the atmosphere is chilled and condensed, but so long as the temperature remains above 32° F., dew is formed instead of frost. Thus, dew may be said to correspond to rain and frost to snow. Practically it may be said that frost is frozen dew. The frost for-

mation on a window pane occurs when the air out-of-doors is below 32°, the moisture being deposited on the glass in the form of tiny prisms of ice.

When the sky is cloudy at night the ground cools less quickly than on clear nights, and for that reason frost and dew are less plenti-

These winter nights against my window pane
Nature with busy pencil draws designs
Of ferns and blossoms and fine spray of pines,
Oak leaf and acorn and fantastic vines
Which she will make when summer comes again.
—T. B. ALDRICH: *Frost-Work.*

At left, in illustration: branching hoar frost. At right: crystalline window frost.

ful after a cloudy night. In the growing season farmers and fruit-growers watch the sky closely on chilly evenings. A cloudless sky is often a cause for anxiety, because frost is destructive to growing things. This is due to the fact that the juice of the plants, which is largely water, swells on freezing and bursts the delicate cells. Because of the damage done by late spring and early fall frosts, the subject of protection from frost has been made a matter of special study by the United States Weather Bureau, and the results are summarized in a bulletin entitled *On Frost Protection.* See DEW. C.R.M.

FROST'BITE, a term applied to the effect of extreme cold on some part of the body. Mild cases are known as *chilblains,* and these occur usually on the hands and feet. The parts affected have a purplish-red color and are somewhat swollen, attended at times with itching and pain. Chilblains appear in the spring and fall, or in winter during damp weather. When first frozen the treatment consists of rubbing the frost-bitten parts with snow or ice, in order to restore slowly the natural warmth and avoid a violent reaction which might cause disease of the bone and soft tissues. In extremely severe cases of freezing, the affected parts may decay and drop off; if the spread of the trouble is not promptly arrested gangrene may develop and delirium and death result. See GANGRENE.

FROUDE, *frood,* JAMES ANTHONY (1818-1894), an English historian, of whom it is said that he was more a man of letters than an historian, as he was prone to distort facts. This tendency to misstate was not a conscious one, perhaps, but he selected certain details and suppressed others for the sake of making his heroes appear brighter and his villains darker. The first two volumes of his *History of England* appeared in 1856, and attracted a great deal of attention on account of the author's brilliant style and the boldness of his opinions. After his visit to the United States in 1872 on a lecture tour he published his lectures under the title *English Misrule in Ireland.* He was the friend of Carlyle, whose literary executor he became. After Carlyle's death Froude published *The Reminiscences of Carlyle, Letters and Memorials of Jane Carlyle,* and *Thomas Carlyle: a History.* In 1892 Froude succeeded the historian Freeman as regius professor of history at Oxford. His lectures were afterwards published in a volume entitled *Erasmus.* Among Froude's other works are *The English in Ireland in the Eighteenth Century* and *Life of Lord Beaconsfield.*

FRUIT, *frute,* a word which in botany refers to the seed of a plant and its covering. The fruit appears in widely different forms, as the pods of peas or nuts of trees, or tomatoes or apples. In a general and more popular sense, however, the name refers only to such edible products of certain plants as are used for food as desserts, in the raw, dried or cooked state. The apple, pear, peach, plum, cherry, orange, lemon, date and fig are among the most familiar fruits in America.

The cultivation of fruits is one of the most important industries. North America ranks first in quantity and variety produced, and in the use of scientific methods of production. The American states east of the Rocky Mountains are supplied with grapes and raisins, citrous fruits, fresh and canned peaches, pears, cherries and apricots by the fruit-growers of California. Canada receives a portion of the crop, as its yearly fruit production of $13,000,000 worth seldom meets the demand. During the winter months Northern markets are furnished with strawberries, peaches and other fruits grown in the states along the Gulf of Mexico. Fresh apples, lemons, bananas and oranges may now be purchased the year round, and pears, strawberries, grapes and peaches have much longer seasons than formerly. Fruits play an important part in international

FRUITS THAT GRANDFATHER DID NOT KNOW

When a Boy

Guava

White blackberry

Kumquat

Cactus pear

Alligator pear

Mango

Grape fruit

Banana

Casaba melon

Plumcot

KATE ABELMANN

trade. In 1914 the United States exported fruits valued at over $31,000,000, and imported almost $34,000,000 worth.

Food Value of Fruits. Fresh fruits do not rank with meats and cereals in actual nutritive value, but they constitute a desirable portion of the diet for other reasons. Certain acids and salts found in them are believed to have a beneficial effect on the system, and their high water content, in some cases four-fifths of the whole, makes them of value as laxatives. Moreover, they are among the most attractive of all foods, both in appearance and in taste, and the pleasure derived from partaking of them has a happy effect on the appetite and the digestion. Decaying and unripe fruits should always be avoided, and it is also unwise to overindulge in those at the proper stage of maturity. As a rule, fresh fruits eaten in moderation are thoroughly assimilated.

Carbohydrates, including sugars, starches and pectin (vegetable jelly), constitute the most important nutritive material in fresh fruits. Protein, fat and ash, the latter the source of certain acids and salts, are found in small proportions. In proportion to their bulk, dried or evaporated fruits contain much more nutritive material than do fresh fruits. The carbohydrate content is also increased when fruits are canned or preserved. S.L.A.

Related Subjects. The following articles in these volumes will give an idea of the many varieties of fruits which are of commercial importance:

Alligator Pear
Apple
Apricot
Banana
Bergamot
Blackberry
Breadfruit
Casaba Melon
Cherry
Citron
Cocoanut
Crab Apple
Cranberry
Currant
Fig
Gooseberry
Grape
Grapefruit
Guava
Huckleberry
Kumquat
Lemon
Loganberry
Loquat
Melon
Mulberry
Muskmelon
Nectarine
Orange
Pawpaw
Peach
Pear
Persimmon
Pineapple
Plum
Pomegranate
Prune
Quince
Raspberry
Strawberry
Tangerine
Watermelon

See, also, the following general articles relating to the subject:

Boys' and Girls' Clubs
Canning Clubs
Food Products, Preservation of

FU-CHOW, or **FOO-CHOW,** in Southeastern China, one of its five treaty ports, thrown open to foreign commerce in 1843. It is an ancient walled city, capital of the province of Fukien, on the Min River, thirty miles from its mouth. The river is crowded with junks and boats, many of which are used as dwellings. The walls of the city are six and one-half miles in circumference and twenty-five feet high, with seven gates guarded by high watchtowers. Fu-chow is sometimes called the "Banyan City" on account of the great number of banyan trees in its gardens and squares (see BANYAN).

The River Min is here partly crossed by a stone bridge, 1,350 feet long, called the "Bridge of Ten Thousand Ages," leading to a densely-populated island which is connected with the opposite shore by a second bridge 300 feet in length. Below this bridge ocean-going vessels load and unload their cargoes. Here also is the most important naval arsenal in the entire country. The chief exports are tin, timber, cotton goods, matches and fruits. Among the principal imports is opium, forced into the Chinese market by the treaty of 1843. The import of this hurtful drug is diminishing under the stringent regulations adopted by the government. Population, about 624,000.

FUCHSIA, *fu'shia,* a beautiful house and garden plant, popular in America and Europe. There are about seventy species, most of which are natives of tropical America. Some are merely shrubby plants, some are small trees and others are climbers. With their gracefully-drooping, funnel-shaped flowers, usually white within and pink, red or purple without, and pistils and stamens dangling, the name of *ladies' eardrops,* sometimes given them, is very appropriate. From the name of their discoverer, Leonard Fuchs, a German botanist, the name was derived.

FUCHSIA BLOSSOMS

Fuchsias are most easily grown from cuttings. They demand a light, porous soil, plenty

of water and protection from strong sunlight. If planted in the spring in a partially-shaded place a fuchsia cutting will develop by fall into a fine plant. Some species make very satisfactory indoor winter plants, and will put forth lovely blossoms for many months if kept well watered and out of the direct rays of the sun.

FU'EL, the name given to numerous substances from which heat is obtained by burning or combustion. When fire was first used by man is not known, but however far back in the distant past it may have been, the question of obtaining materials to feed fires has ever since been one of great importance. When forests overran the land a supply was always available, but as the value of wood for building purposes constantly increased it was necessary to seek other substances. Coal, which has become the standard fuel by which all other fuels are measured, was known to the Greeks at least 300 years before the Christian Era. It possesses the advantage of furnishing great heat, but has the disadvantage of being heavy. Other solid fuels include coke, charcoal, peat, and bricks made from coal dust and tar or other adhesive substance. Liquid fuels include petroleum and its products, alcohol and many kinds of vegetable and animal oils. The chief gases for heating are coal gas and natural gas.

Heat Values. Calculations based on experience show that the relative value of coal and wood is 2½ to 1; that is, two and one-half pounds of wood must be burned to produce the same amount of heat as would be obtained from one pound of anthracite coal. Oils have nearly double the heat value of coal, and are also less injurious to engines and furnaces in which they are used. Oil fires may be instantly started or extinguished; the oil produces little smoke and leaves no refuse. On the other hand, there may be danger of explosion, and there is always some loss of oil by evaporation. Three and three-quarter barrels of crude petroleum, each containing forty-two gallons weighing six and one-half pounds per gallon, have a fuel value equal to one ton of coal. The use of gasoline is increasing so rapidly that it is evident that the number of engines operated by that fuel will rapidly increase.

Gases. Natural gas is an ideal fuel, with fifty per cent greater heat value than coal gas. It can be obtained only in a few locations, however, so its utility is not widespread. For domestic purposes, coal gas has many advantages. It prevents waste, as it need only be burned while its heat or light is actually needed, and can be easily extinguished or lighted. To the consumer the gas costs from seventy-five cents to one dollar and fifty cents per 1,000 feet. The heat value of 1,000 feet of gas is equal to fifty-nine pounds of anthracite coal.

Charcoal is extensively used in chemistry, industrial arts and for melting metals. It burns quickly and leaves little ash. Coke produces violent heat and possesses qualities very similar to those of charcoal. Peat is a low grade fuel that is used extensively for domestic purposes, especially in Ireland, where the greatest peat bogs abound.

Related Subjects. The reader is referred to the following articles in these volumes:

Charcoal	Gas
Coal	Gasoline
Coke	Peat
Forests and Forestry	Petroleum

FUGITIVE SLAVE LAWS, statutes passed during the slavery controversy in the United States, providing for the return to their masters of runaway slaves escaping from one state to another. In the Ordinance of 1787 (which see) a clause provided for the return of slaves who had escaped to the free territory of the Northwest. The first fugitive slave law, passed in 1793, allowed an owner upon the presentation of an affidavit to secure the arrest and return of a slave who had escaped to free soil. The runaway slave had no right to trial by jury or to give any evidence in his own behalf. Some of the Northern states, opposed to the operations of this law, passed personal liberty laws forbidding state officers to aid in the recovery of fugitives. In 1850 another fugitive slave statute was passed, inflicting heavy penalties for refusal to aid in the capture of runaway slaves. The owner's oath was made sufficient evidence for the slave's return. This law increased the sentiment against slavery throughout the North. The opposition to the law reached its climax in the North at the time of the publication of *Uncle Tom's Cabin* by Harriet Beecher Stowe, and hastened the war between the two sections (see WAR OF SECESSION).

FUJIYAMA, *foo je yah' mah,* **FUJI-NO-YAMA,** or **FUJI-SAN,** the beautiful sacred mountain of Japan, rising 12,395 feet above the sea, sixty miles west of Tokyo. Each summer thousands of pilgrims from all parts of the empire climb by one of the five paths to

its summit, or worship at the shrines and temples along the way. Moreover, it is one of the most interesting objects in all Japan for tourists. Through Japanese legend and art, as shown on many objects, from beautiful

FUJIYAMA

screens to dainty fans or teacups, all nations of the world have come to know this perfect cone-shaped "Matchless Mountain," with its snow-capped peak caressed by clouds. That it was once a flaming volcano is now almost forgotten, for the last eruption from its 500-foot crater took place in 1707.

FULGURITE, *ful'gu rite,* a term derived from the Latin word *fulgur,* which means *lightning,* and has been modernly applied to an explosive. Technically, fulgurite is a rocky substance, formed into a sort of impure glass by fusion caused by a stroke of lightning. It is therefore somewhat rare, and assumes the form of a vertical tube. Sometimes these tubes run for several feet downward in the sand, but they are rarely found in hard or compact rock. The tubes have the appearance of opaque glass. Particles of minerals like mica and feldspar are more easily melted than materials which are composed largely of quartz.

FULLER, MARGARET. See OSSOLI, SARAH MARGARET FULLER.

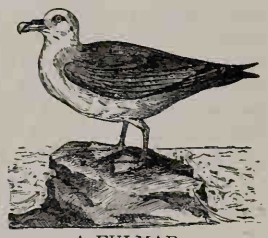
FULLER, MELVILLE WESTON (1833-1910), Chief Justice of the United States Supreme Court for twenty-two years. On Monday, April 30, 1888, he was nominated by President Cleveland to fill the vacancy occasioned by the death of Chief Justice Morrison R. Waite. President Cleveland said that a Chief Justice was needed who would be a man of efficiency as a business manager, and within a year, under Fuller's direction, the old-time delays in the business of the Court began to be remedied. He systematized the work so as to eliminate the law's delays as far as possible, thus proving that the right man had been chosen.

MELVILLE W. FULLER
For twenty-two years Chief Justice of the Supreme Court of the United States, the highest judicial post in the world.

He was a graduate of Bowdoin College at the age of twenty, studied law at Harvard, and was admitted to the bar in Augusta, Me., in 1855. In 1856 he moved to Chicago, where he practiced law for thirty-two years. He became a member of the Illinois constitutional convention in 1862, the following year was elected to the state legislature, and four times was a delegate to the Democratic National Convention for the nomination of the Presidential candidates. He withdrew from active politics in 1880. He was one of the arbitrators of the Anglo-Venezuelan controversy in 1899.

FULLER'S EARTH, a variety of clay sometimes used for cleaning cloth that has been soiled by grease or oil. It is in the form of a fine powder which is very porous; when applied to cloth the earth absorbs the grease. Fuller's earth was formerly used in factories for scouring woolen fabrics, but other methods have replaced it. It is composed of alumina, silica, magnesia and lime, and feels like powdered soap.

FUL'MAR, a name applied to any of several species of oceanic petrels. The common northern fulmar is about the size of a duck. It abounds in most northern seas, and breeds on the rocky shores of the Faroe Islands, Iceland, Greenland, Spitzbergen, etc., making an excavation in high, rocky places for its nest, in which it lays one egg. It is rarely found on the United States coast south of Massachusetts, or on the southern coasts of Great Britain, but is most in evidence on Saint Kilda, in the Outer Hebrides, Scotland, and neighboring isles. Its flesh and eggs are highly prized by the inhabitants of Saint Kilda. The bird is also valued for its feathers, down and oil. It feeds on any animal substance, with a preference for whale blubber. See PETREL.



A FULMAR

FULMINA'TION, in chemistry, a word describing an explosion of certain compounds by percussion or heat. *Fulminates,* or explosive compounds consisting of fulminic acid and mercury, gold, silver or platinum, are used as priming in percussion caps to cause the explosion of gunpowder in cartridges and shells. Fulminate of mercury, most commonly used, is obtained by dissolving mercury in nitric acid and then adding alcohol to the solution. The fulminating, or explosive, mercury is deposited in crystals; the process is attended with danger, as when dry the crystals explode if struck even lightly by any hard substance.

FUL'TON, N. Y., a center for the cheese trade of the northern part of the state, is situated in Oswego County, on the east bank of the Oswego River and on the Oswego Canal, a branch of the New York State Barge Canal (which see). The city of Oswego is twelve miles northwest and Syracuse is twenty-six miles southeast. The New York, Ontario & Western, the New York Central and the Delaware, Lackawanna & Western railways serve the city. Electric lines connect with points north and south, and water transportation is had with Lake Ontario through the canal. In 1791 the first settlement was made, in 1835 it was incorporated as a village, and in 1902 the villages of Fulton and Oswego Falls consolidated and were incorporated as the city of Fulton. A Federal estimate in 1916 indicated a population of 11,908, an increase of 1,428 since 1910. The area of the city is a little more than three square miles.

Fulton has a considerable trade in milk and tobacco. Its principal industrial plants include paper mills, canneries, flour mills and manufactories of infants' food, chocolate, firearms, woolen goods and paper-mill machinery. About 2,800 people are employed in the factory of one woolen company. Fulton is also actively engaged in the building of motor boats, canoes and yachts. A post office, erected in 1915, a city hall and a public library are the most notable buildings. City Park, Schenck Park and Fultonian Park are attractive recreation and amusement spots. D.S.H.

FULTON, Robert (1765-1815), an American engineer, inventor of the first successful steamboat and of the first steam-propelled war vessel. Though he hit upon the idea of steam navigation independently, he was not the first to try it; but this by no means detracts from the glory of his achievement (see Fitch, John). He was born at Little Britain, Pa., a town which has since been rechristened Fulton, and because of the poverty of his parents he was in school only long enough to learn to read and write. While working for a jeweler he took up portrait and landscape painting with such success that he was able to buy a farm and in 1787 to go to London to study painting with his noted fellow-countryman, Benjamin West. Acquaintances whom he made there discovered in him the mechanical genius which he himself seems not to have felt, and induced him to devote himself to engineering. A patent for a double-inclined plane to be used instead of canal locks, patents for flax-spinning and rope-making machines and for a marble-cutting mill—these were evidences that his genius was of the practical and usable kind.

ROBERT FULTON

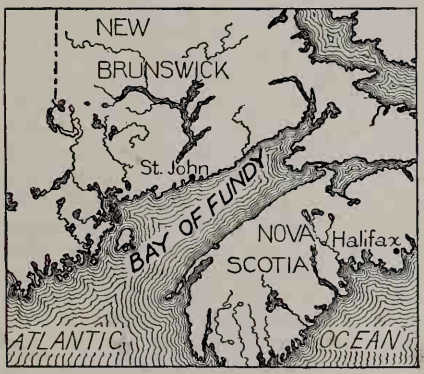
In 1796 he went to Paris and there worked diligently upon one of his great ideas—a submarine torpedo boat. Though he demonstrated the value of his invention, neither the French nor the English nor the American government was interested in it, and he turned his serious attention to the making of a steamboat. The first successful one was launched on the Seine in 1803, but the French government refused to take up this invention also, and Fulton returned in 1806 to the United States, having first revisited England and sent home an engine. In 1807 he launched upon the Hudson the famous *Clermont,* which puffed slowly up the river to the amazement of the thousands of spectators who had gathered to watch the wonder. Five miles an hour was its average speed, but an increase in that proved a comparatively easy matter when once he had established the principle. Later Fulton constructed for the United States government various engineering works and the steam frigate *Fulton,* launched in 1815, and was engaged on an improvement of his submarine torpedo when he died. Great honor was paid him in his latter years, and he had the happiness of knowing that his work was appreciated. He might have been wealthy, but lawsuits over the infringement of his

patent rights kept him almost poor, and hastened his death. In 1909 a centennial celebration of the launching of the *Clermont* was held, and an exact model of that boat steamed slowly up the Hudson.

Consult Knox's *Life of Robert Fulton;* Thurston's *Robert Fulton: His Life and Its Results.*

FUMIGATION, *fu mi ga'shun,* the act of applying fumes or smoke for various purposes, such as the disinfection of clothes or houses. The agents that are generally employed for this purpose are sulphur, formaldehyde and chlorine gas. Sulphurous gases, formerly used as disinfectants, have irritating qualities, and as they tarnish all silver and brass and have an unpleasant odor they have been generally superseded by formaldehyde solutions, which cause no damage and are efficacious in destroying infectious germs. In many large cities the quarantine stations have established plants for producing steam, which is used to obtain sterilizing heat. After fumigation has taken place the room should be kept closed for six hours, then be thoroughly ventilated and opened to sunlight. If an unpleasant odor remains it may be dissipated by the use of small open vessels filled with ammonia. Thorough cleaning and sunning of rooms should always accompany fumigation, as the latter is not an infallible process. See DISINFECTANT; FORMALDEHYDE. W.A.E.

FUNDY, *fun'di,* BAY OF, an arm of the Atlantic Ocean, separating the southern part of



LOCATION MAP

the Nova Scotia peninsula from New Brunswick. It is 180 miles in length, with an average breadth of thirty-five miles; at the mouth its breadth is forty-eight miles. At the head it divides into two branches, that on the north called Chignecto Bay, and the southern, Minas Channel, which gives entrance to Minas Basin and Cobequid Bay. On its northern shore it receives the waters of the Saint John and the Saint Croix rivers, both of which form part of the international boundary between New Brunswick and the state of Maine.

The bay is noted for its high tides, which sometimes rise nearly sixty feet and cause dangerous bores or tidal waves. There is a general belief that the tides here are the highest in the world; this is an error, since they reach equal heights in numerous other places. Fogs are frequent in the bay and make navigation difficult. Passamaquoddy Bay, opening off its western shore, is a magnificent natural harbor. The chief ports on the Bay of Fundy are Moncton, Saint Andrews and Saint John in New Brunswick; Annapolis and Digby in Nova Scotia. At the entrance there are numerous islands off the coasts of Maine, New Brunswick and Nova Scotia.

FUNGI, *fun'ji,* flowerless plants which have no green coloring matter (chlorophyll) to help them assimilate food, so they live on other plants or animals, either dead or alive. It has been estimated that there are about 250,000 fungi, only about one-third of which have been described. They grow everywhere—in water and in and above the soil. Some are so small they cannot be seen with the naked eye; others are threadlike, and some, like the toadstools, grow as high as two feet.

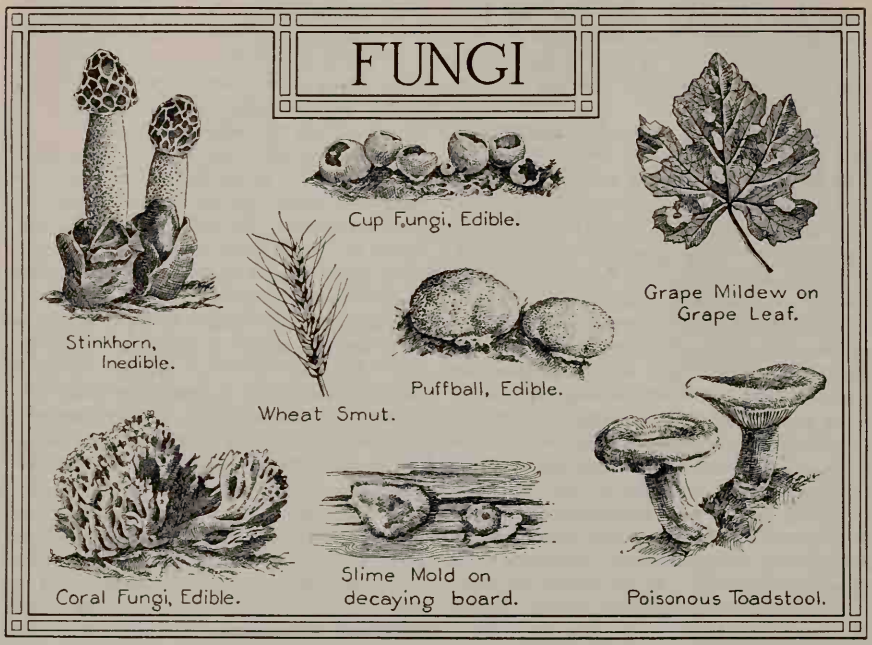
There are two general classes of fungi; one comprises those which live on dead or decaying things, known as the *saprophyte* fungi; the other is the *parasite* fungi, which grow on living plants or animals. Some species, including the mushrooms and truffles, are edible; others are used in medicine and the arts, and all are beneficial in that they turn plant matter back into soil. But many species are very destructive; among these are the smuts, rusts, mildews and molds. Many others cause diseases in man and animals. See page 2350 for illustrations.

Related Subjects. The reader is referred to the following articles in these volumes:

Bacteria and Bacteriology	Rust
Mildew	Smut
Mushroom	Yeast

FUNGICIDES, *fun ji'sydz.* See INSECTICIDES AND FUNGICIDES.

FUNSTON, *fun'stun,* FREDERICK (1865-1917), major-general of the United States army, seasoned veteran and modern military hero. He



traveled from the arctic regions to the tropics, in various capacities, finding adventure everywhere. Born at Carlisle, Ohio, he was successively instructor in the state university at Lawrence, Kan., a farmer, train conductor and newspaper reporter. In Alaska, where he was sent by the United States Agricultural Department to report on the plant life of the country, he made the longest trip ever attempted by a white man on snowshoes. He paddled down the Yukon in an open boat and absolutely alone, a distance of 1,100 miles, and secured important botanical specimens.

MAJOR-GENERAL FUNSTON

In 1896 he joined the insurgents in Cuba under General Garcia, against the Spaniards, was wounded three times, and later captured by the Spaniards. Upon his release, he returned to the United States. At the outbreak of the Spanish-American War, the "Fighting Bantam of the Army," as Funston was called (he was only five feet tall), became colonel of the Twentieth Kansas Volunteers, and was ordered to the Philippines, where many daring exploits made him the military hero of that war. After the capture of Aguinaldo, which is the most celebrated, although not the most thrilling, of his adventures, President McKinley appointed him brigadier-general. He was placed in charge of the work of restoration of peace and order after the San Francisco earthquake in 1906. When trouble with Mexico seemed certain in 1913 he was given command of the American troops at Vera Cruz, where his varied experience again made him of invaluable service to his nation. In 1916, when the United States sent an expedition into Mexico to capture the bandit Villa, who had fallen from his high estate as a popular leader of the revolution, Funston was put in command of the situation. He did not accompany the forces south, however, the immediate command being given to his subordinate, General Pershing.

On February 19, 1917, General Funston dropped dead in a San Antonio (Tex.) hotel. The cause of death was given as hardening of the arteries. His body was conveyed to San Francisco for burial.

FUR AND FUR TRADE. Ever since the beginning of history the skins of certain animals have been eagerly sought, either for personal adornment or for use as protection against the cold. The winter covering of animals living in northern latitudes provides the choicest fur, and men willingly risk their lives, year after year, spending the winter months in the frozen wilderness to bring back to civilization in the spring the results of their skill as hunters and trappers. The animals chiefly sought are the seal, beaver, badger, marten, ermine, muskrat, fox, skunk, wolf, wolverine, lynx, sable, mink, otter and bear. The trapper does not in any way prepare the skins for market; he stretches them over boards, dries them in the cold air and delivers them in that condition to the buyer.

So great is the present demand for furs that to meet the supply nearly 145,000,000 wild animals are killed every year. The best furs are obtained during the coldest weather in the coldest regions of the earth. At such times fur-bearing animals are provided with a thick woolly covering beneath the long hairs of the fur, and to this extra covering is due the value of the pelt. Trading posts have been established in all fur-bearing countries, with stores from which trappers may purchase supplies. At these posts huge quantities of skins are collected, to be later sold by auction in the world's great fur markets, the chief of which are London, England; Leipzig, Germany, and Nijhni Novgorod, Russia.

Fur Trading Companies. The fur trade of America has for more than two centuries been of great importance. Early settlers established a chain of trading posts extending from Hudson Bay to New Orleans. Bitter war was waged between British and French companies, in which the Indians often took sides. The French were gradually forced from the Canadian fur-trapping grounds. In 1760 Charles II of England granted a monopoly to a company founded under the name of the Hudson's Bay Fur Trading Company. The monopoly was confined at first to the regions around Hudson Bay, but eventually the company extended its operations to every part of Canada. In 1869 the government of Canada paid to the Hudson's Bay Company the sum of $1,500,000 as compensation for surrender of its monopoly and territories held; since that time equal privileges have been extended to all. The principal rival of the Hudson's Bay corporation is Revillon Frères, usually spoken of as the "French Company," with many trading posts, some standing almost side by side with those of the Hudson's Bay Company.

Alaska produces the greater part of the fur supply of the United States. Until 1913 these furs were nearly all sent to London to be dressed and cut, only a few finding their way direct to American factories. Indeed, the American market is still small, and most of the furs sold in the stores of the great cities have been sent first from Canada and Alaska to London or Leipzig. The Alaskan seal fisheries are of great importance, but the number of seals that may be killed each year is now strictly regulated by the United States government. Attempts are being made to develop the fur market of Saint Louis, and in 1913 the greater portion of the skins from Alaska were sent there. The War of the Nations practically closed the European markets for a time, and gave an added impetus to American enterprise.

Canadian Furs. The total value of the furs annually produced in Canada is estimated at about $2,000,000. Muskrats head the list, with a total of nearly 1,000,000 skins valued at $256,000. Martens and minks are valued at over $220,000; beavers, $131,000; ermine, $22,000; wild foxes of all kinds, $185,000; otters, $102,000; skunks, $17,515; fur seals, $5,000; lynx, $114,756; wolves, $16,452; bears, $45,000.

Fur Farming. A new and important industry has been created in Canada in the breeding of black foxes. This has extended from Prince Edward Island, where it originated about 1900, to Nova Scotia, Quebec and other eastern parts of the Dominion. The fur of the black and silver tip foxes occupies such a place among furs as is held by diamonds among jewels. It cannot be artificially duplicated, and it is so

much desired by the wealthy that a good skin is worth $4,000 or $5,000. The Canadian government has encouraged the industry, which now represents investments of more than $12,000,000. A pair of foxes for breeding purposes will command as much as $30,000 or $40,000 in the open market. Skunks are raised on many farms in the United States, and the industry proves profitable. Minks are also bred in captivity, but the quality of the fur does not equal that of the mink of the frozen north.

Prices of Furs. The price of furs varies perhaps more than that of any other commodity of changeable value, and ranges for a hide from a few cents to several thousand dollars. In the early days of the Hudson's Bay Company the most valuable furs could be bought from Indians for a few glass beads. Rifles were sometimes exchanged for furs; sometimes the Indian trapper was made to build a pile of furs, laid flat one above another, to the height of the gun in payment. The rifles were of the old-fashioned, long-barreled type, costing only a few dollars. The pile of furs would sometimes be worth thousands of dollars to the white man, but the Indian could not appreciate their value. Methods have now greatly changed, and the fur companies have established a reputation for fair dealing. Assistance is given to trappers who are left entirely without means if they have a bad season. The Hudson's Bay Company always extends credit to its trappers, and assists them until a good season comes. The price paid to the trappers is, of course, less than the open market price, but in a fair season a skilful trapper may make considerably more than enough money to keep him through the spring and summer. The prices quoted in the following list of most commonly used furs are about the average paid in the open markets:

Beaver, $5 to $25	Ermine, 25¢ to $2.50
Chinchilla, $4 to $12	Fox, silver, $1,200 to $5,000
Fox, red, $1 to $8	Lynx, $5 to $35
Marmot, 25 to 60 cents	Marten, $5 to $20
Mink, $3 to $10	Muskrat, 10 to 50 cents
Sea otter, up to $3,000	Otter, $10 to $35
Raccoon, $1 to $5	Sable, up to $50 or $60
Skunk, $1 to $3	Seal, $5 to $20
Squirrel, 5 to 15 cents	Wolf, $5 to $10
Civet, 25 to 50 cents	

How Animals Are Skinned. The skinning of trapped animals is an operation requiring great care, as any damage materially lowers the value of the pelt. In the piercing cold of the far north the animals are generally frozen hard and stiff when removed from the trap. Before they can be skinned they must be thawed in the hut of the trapper. The skins of all small animals such as minks, martens, otters, foxes and ermine are removed "closed." With a sharp knife a cut is made from the center of the hind claws up the leg, across the body and down the other leg to the claws. The tail is skinned by forcibly removing the stump without cutting the skin, which is then turned inside out and removed from the body like a glove. The skin is then stretched on a piece of wood of the proper shape, with the fur inside. The skins of larger animals, such as wolves and bears, are removed by being cut from the throat the full length of the body.

Fur Dressing. It is generally admitted that the German furriers excel in dressing small skins and those that require delicate handling, while the English methods are best for heavy furs. The first process of dressing is to clean the skin and carefully remove all traces of fat and flesh. Grease is then rubbed in carefully, the skin being thoroughly kneaded. Great care is taken to preserve the natural oils of the fur. Matching of skins requires skill and a good eye for color, as the effect of a garment might be spoiled by use of skins of different shades.

Imitations. A large number of imitation furs are placed on the market, and the workmanship is so skilful that it is very hard to discover the difference between them and the genuine. Some imitations are sold with the clear understanding that they are not genuine, but deliberate deception is often practiced. The domestic cat provides a wide variety of furs, when carefully prepared and dyed. White rabbit fur is often sold as ermine, chinchilla or even fox. The muskrat provides a fur that lends itself readily to imitations, and it appears as seal, mink, sable and otter. Dyed hare skins are sold as sable, fox or lynx. Common red fox skins are dyed to imitate black fox, and with white hairs added, are offered for sale as silver fox. It is easy to distinguish badly or heavily dyed imitations, as the under fur is darkened beyond its natural state and the skin itself is stained, but a cleverly-dyed skin will deceive all but the expert. Especially in lightly-dyed furs, when perhaps only the tips of the hairs have been treated, anyone but an experienced furrier would be deceived. The prices offered for imitations are usually much less than the recognized price of genuine articles. F.ST A.

Related Subjects. Each animal referred to in the above article is described in its alphabetical place in these volumes. In addition, see the following:

Canada, page 1102 Hibernation
Game (Game Laws) Seal

FURIES, *fu'riz,* in Greek mythology, three sisters named Alecto, Tisiphone and Megaera, who were attendants of Proserpina, the goddess of death and the underworld. They sprang from the blood of the wounded Uranus, and were noted for their hard hearts as well as the merciless manner in which they hurried the ghosts intrusted to their care over the fiery flood of the river Phlegethon to eternal torment. Their heads were wreathed with serpents and they watched remorselessly for every soul they could catch. Virgil says in describing Hades:

"before the gate,
By night and day, a wakeful Fury sate,
The pale Tisiphone; a robe she wore,
With all the pomp of horror, dy'd in gore."

FUR'LONG, an English term for the distance of forty rods, or one-eighth of a mile. It originally referred to the length of a furrow, which would ordinarily be the length of a field, but like other originally indefinite terms of measure, it gradually acquired a definite value. Among the old English writers one-eighth of a mile of any of the world's standards of measurement was called a furlong, and as early as the ninth century the word was used in the sense of the Latin *stadium,* which was one-eighth of the Roman mile. The term is now little employed. See Mile.

FUR'NACE, an enclosure or structure of metal, brick, earthenware or other material, in which a fire developing great heat may be maintained. The heat is utilized for melting metals, heating a boiler, baking pottery, warming a house and for many other purposes. The furnace should be so constructed as to provide the greatest possible heat from the fuel consumed, and to concentrate the heat where it is most required. The fire in ordinary *air furnaces* is kept burning by natural drafts. When extreme heat is required air is forced through the fire by bellows or blowing machines. Furnaces fitted with such devices are called *blast furnaces.* For melting metals a *reverberatory furnace* is sometimes used. In this device the flames are forced against a low, arched roof from which they are deflected to the objects to be melted.

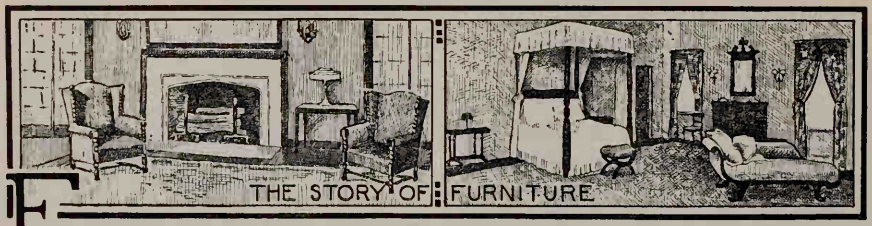
The furnaces mentioned above burn coal or coke. Furnaces requiring gas fuel are becoming steadily more important and have great advantages over those burning coke or coal. Gas leaves no ash; it produces a very high temperature and can be instantly lighted or extinguished.

Electric Furnace. The electric furnace, which is of recent invention, has proved so successful that it is expected to revolutionize the steel industries, for by means of it a temperature far higher than that ordinarily reached in any of the older types of furnaces is easily obtained. To the reader without a technical knowledge of such matters it might seem that the temperature of 2000° Centigrade obtainable in a non-electric furnace must be high enough for any process, but the worker with metals finds that there are various processes which can be far more satisfactorily carried on by means of the 3500° temperature which the electric furnace affords. Carborundum, graphite, high grades of iron and steel, calcium carbide and aluminum are best produced in this intense heat.

Electric furnaces are of two types, resistance furnaces and arc furnaces. In the former, a very refractory material—in other words, a very poor conductor—is made use of, and the passage of electricity through that substance causes the heat. In the arc type, a great electric arc is formed of carbon, and is enclosed in a chamber formed of some substance which will allow neither the electricity nor the heat to escape. Of course electric furnaces are practicable only in regions where electric power can be generated without great expense. See Electric Heating.

FUR'NESS, Horace Howard (1833-1912), an eminent American Shakespearean scholar who probably knew more about Shakespeare, his plays, their sources and texts, than any other man since the days of that greatest of all dramatists. In 1871 he published the first of his famous series, known as the *Variorum Shakespeare,* which included fifteen volumes, each a monument of patient study.

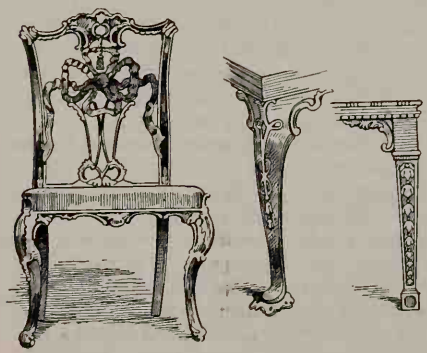
Dr. Furness was born in Philadelphia, was educated at Harvard College and at Halle, in Germany, and was admitted to the bar in 1859. He represents the finest type of the leisurely scholar; but neither the deafness with which he was afflicted nor his seclusion from the activities that make up modern life could make him unsympathetic with his fellowmen. It is said he always carried in his pocket a card upon which was written, "Don't blame the driver. It is not his fault. I am deaf."



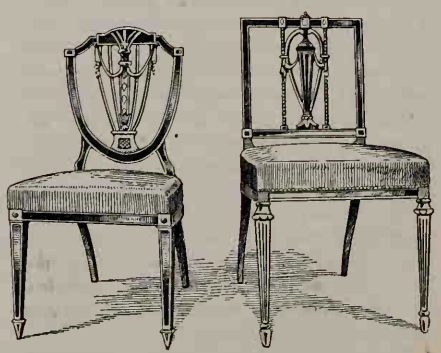
FURNITURE. The furnishings of the typical modern household are the result of little more than four centuries of furniture-making, for furniture in the present sense of the word is a development of our later civilization. Marbles, and such costly woods as cedar and ebony, and ivory, bronze, gold, silver and precious stones have been used from earliest times in the construction and decoration of household furnishings, but even the most magnificent mansion of the ancient Egyptians, Assyrians, Greeks or Romans lacked many of the familiar appliances found to-day in the humblest home. The chair, the couch, the table and the bed were the principal articles of furniture used by ancient and medieval peoples. In Europe, fixed tables were the exception until the sixteenth century, the usual custom being to lay sets of boards across uprights when it was time to serve meals, and chairs did not become common until the seventeenth century. A modern householder would think the medieval castle of the European nobleman a meagerly-furnished place indeed

The Notable French Periods. The awakened interest in all forms of art was extended to furniture during the period of the Renaissance (which see), and Florence, Rome, Venice and Milan became important centers of cabinet-making. The Italian influence was felt especially in France, where, during the reigns of Louis XIV, XV and XVI, furniture of the most exquisite design was produced. Under the first of these three monarchs the curved line in furniture became established; in the reign of Louis XV the love of ornamentation reached its height, many of the cabinets, commodes, bureaus and bookcases of the period showing painted landscapes elaborate in design and brilliant in hue. Marvelous effects were also produced through carving, inlaid work and the use of bronze or brass ornamentation. In this reign also there was a return to the straight line in furniture, which prevailed through the next period. Mahogany became the favorite wood of the cabinet-makers under Louis XVI, but gilded or enameled walnut was also used. Among the most notable achievements of this period are the Louis XVI chairs and sofas, with fluted, tapering legs, and carved frames enclosing beautiful tapestry backs. During the empire, grace, elegance and refinement in furniture were replaced by heaviness and solidity; this is known as the period of decline.

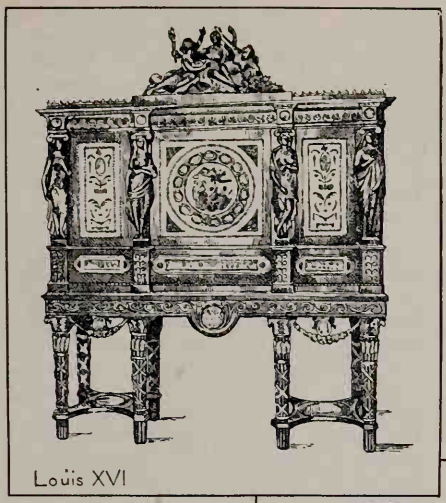
English Development. In England, as in France, the eighteenth century was a period of achievement in cabinet-making. Under the



CHIPPENDALE DESIGNS
A chair, and cabriole and taper legs of tables.



SHERATON CHAIRS
Two chairs in the characteristic Sheraton designs.



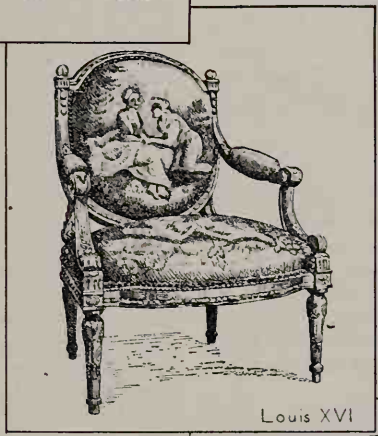
Louis XVI

four Georges, from about 1715 to 1830, mahogany took the place of walnut and oak, previously used, and the furniture of the period shows a decided contrast to the massive, square types especially characteristic of the Elizabethan Age. Grace and beauty mark the work of the three great masters of the Georgian period—Thomas Chippendale, "the master of line," George Heppelwhite, "the exponent of elegance," and Thomas Sheraton, "the purist." Each of these cabinet-makers set a fashion in furniture which has become an established vogue.

Chippendale's chairs best represent his genius (see illustration). These are characterized by the curved leg (cabriole), with ball and claw foot, the outward-curving side frames of the back, and the top rail shaped more or less like a cupid's bow. Especially beautiful in design are the centers of the backs, which he filled in with carved ribbon or lattice work, showing an almost limitless variety of figures. Chippendale's name is also associated with china cabinets and bookcases with glass fronts, writing desks with glazed doors, settees beautified by fretwork, and tables of various designs. His furniture is notable both for its solidity and its delicacy.

In the construction of his chairs, Heppelwhite, like Chippendale, produced his most characteristic designs. The backs are usually oval or shield-shaped, with decorative middle-pieces, and the legs are square and tapering. Exquisite proportion gives these chairs an effect of remarkable elegance and refinement. Heppelwhite also perfected the sideboard in its modern English form, and his furniture shows the most tasteful use of inlay and veneers in the history of English cabinet-making. To him also are attributed many choice urn stands, tea trays, chests and caddies.

Sheraton's name is associated especially with furniture decorated with painting. He worked both in mahogany and in satinwood, and in his tasteful use of inlay he was almost the equal of Heppelwhite. Practicability as well as beauty distinguishes his furniture. He invented a summer bed divided in the center in such a way as to permit a better circulation of air, a hollow-front sideboard and the work table with a pouch of silk on each side, which is still popular with housewives. His satinwood furniture consisted mainly of commodes, bureaus, small writing desks, toilet tables and other boudoir furnishings, many of which were exquisitely decorated with painted designs.



Louis XVI

Louis XVI

Modern Taste in Furniture. All of the French and English eighteenth-century styles of furniture have been copied by European and American manufacturers, and these have made their way into many twentieth-century homes; but recent years have seen an ever-increasing popular demand for furniture which is in keeping with present-day ideals of utility, comfort and beauty. Simplicity and durability, typified by the dignified and substantial mission furniture and its modifications, are qualities which commend themselves to the best modern taste. "Have nothing in your room that you do not know to be useful," is sound advice from that famous English manufacturer of artistic furniture—William Morris (which see). The practice of filling the house with useless bric-a-brac, cheap pictures and vases, tables and chairs with fragile legs and furniture that is weakly constructed and showily decorated cannot be too strongly condemned. Plain, well-made artistic furniture, which lasts indefinitely and can be easily kept in sanitary condition, lends dignity to the humblest home.

Popular Woods. Oak has long been a favorite wood for the furnishings of hall, library and dining room; mahogany, curly birch and maple are all utilized for bedroom furnishings, and mahogany is widely used both in the dining rooms and drawing rooms of the better-furnished homes. Circassian walnut, a beautiful Russian wood, is an established favorite in America for bedroom furniture. The better woods being expensive, veneering is much employed.

The American Furniture Industry. There are in the United States about 3,200 factories for the manufacture of furniture, which require the services of nearly 130,000 men and women. The value of the yearly output to the manufacturers is about $371,000,000. The three leading states in the industry are, in order, New York, Michigan and Illinois, the two latter being practically equal in value of products. The chief centers for the manufacture of furniture are New York, Chicago, Grand Rapids (Mich.), Philadelphia, Saint Louis and Boston. Until about 1900 Grand Rapids was the greatest furniture manufacturing city in the world.

It is interesting to note that the familiar rocking chair is entirely an American creation, and so, too, are the folding bed and its adaptations, and the chiffonier. In equipment and organization, American furniture factories are superior to any others throughout the world.

In the Dominion of Canada there are over 170 furniture factories, representing an investment of about $6,500,000. Ontario, with about 120 factories, is the most important center of the industry, and Quebec, with about forty, is next in rank. B.M.W.

Consult Lockwood's *Colonial Furniture in America;* Litchfield's *Illustrated History of Furniture.*

FUR'NIVALL, Frederick James (1825-1910), an English philologist and one of the most influential workers in the history of English scholarship. He will be remembered through his success in founding, for the publication of texts, The Early English Text Society, The Chaucer Society, The Ballad Society, The New Shakespeare Society, The Browning Society, The Wycliffe Society and The Shelley Society. Chiefly through the medium of these societies, he edited numerous manuscripts, including his monumental work—the Six-Text edition of Chaucer's *Canterbury Tales.* He likewise edited a series of forty-three facsimiles of the quartos of Shakespeare's plays, a work which won for him his greatest distinction, from an American standpoint. Dr. Furnivall was born at Egham, in Surrey, and was educated at University College, London, and at Cambridge.

FUR SEAL. See Seal, subhead *Fur Seal*; Fur and Fur Trade.

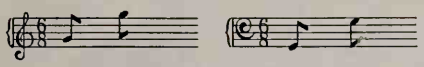
FUSE, *fuze,* an abbreviation of *fusil,* meaning *a gun,* is the name given to many devices used for discharging explosives in guns, shells and mines. The simplest form of fuse is made of waterproofed jute yarn spun round a core of explosive powder. The explosive is usually of gunpowder, mixed with chemicals to make it burn slowly. One end of the fuse is connected with the charge to be exploded, the other end being ignited. The fuse burns until the sparks reach the charge, when the explosion occurs. Ordinary fuse of the type mentioned above burns at the rate of one foot in half a minute. All blasting operations formerly were thus timed by regulating the length of fuse, but charges are now usually fired by electric fuses. A metal cylinder, containing two copper wires connected by a very fine fusible wire, is filled with explosive and placed in the blasting charge. An electric current is sent through the wires, causing the thin connecting wire to fuse and produce a spark which sets fire to the charge.

FUSING POINT. See Melting Point; also Freezing.

Gg

G, the seventh letter in the English alphabet, derived, like almost all the others, from the Phoenician. The name for it in that language was *gimel,* or *gamel,* which meant that most important of all animals at the time, the camel, and the letter itself was at first probably a rude picture of a camel. Later it was more and more carelessly drawn, until it looked much like the figure 7, and this symbol the Greeks, who borrowed the letter and saw in it no relation to any animal, turned around (see C). Their *gamma,* like the Phoenician *gamel,* had only the hard sound of *G,* as in *go,* but the Romans when they borrowed it made it stand for that sound and the sound of hard *e,* as well. The Romans also made it a curved letter, so that it looked like the modern *C,* and gradually, as they distinguished between the two sounds it bore, they added a little bar below the opening to show that one was *G* and one was *C.*

In English the letter has two distinct sounds, the so-called soft sound as in *gem,* and the hard, as in *gave.* Most commonly the hard sound is given before the vowels *a, o* and *u,* as in *gale, got, gull,* and at the end of a word, as in *big;* the soft sound occurs before *e, i* and *y,* as in *gentle, gist.* To this rule there are numerous exceptions. In music, *G* is the fifth tone in the major scale of *C.*

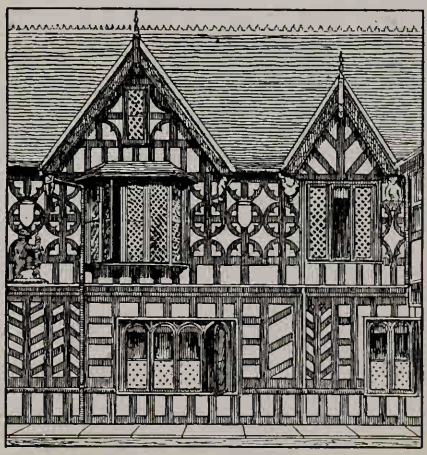


GABERS, *ga'burz.* See GHEBERS.

GABLE, *ga'b'l.* When a building has a "peaked" or sloping roof there is formed at each end a triangle between the eaves and the ridge of the roof. This triangular upper part of the end wall is called a gable—a name which comes from an old Celtic word meaning *fork.* In his poem of *Evangeline* Longfellow writes, describing the picturesque homes of the Acadian peasants:

Thatched were the roofs, with dormer windows; and gables projecting
Over the basement below protected and shaded the doorway.

Gables were extremely popular with medieval builders, and in many old European cities —such as Brussels, Bruges, Antwerp, Louvain and Nüremberg—the traveler will still see steep-roofed houses and town-halls that were built during the fourteenth and fifteenth centuries, their quaintly-ornamented gables facing the street instead of being at right angles to it, as is the usual custom in our day. In the gables of Holland, Belgium and Germany especially, square indentations called *corbie steps* were frequently cut into the sides of the tri-



GABLE OF ELIZABETHAN PERIOD

angle, making what is known as a *crow gable* or *stepped gable*.

GA'BRIEL, in Bible story, was the favorite of the seven archangels of Jehovah, and the one chosen to carry His messages to mortals. The name, which means *hero of God,* indicates how well fitted this angel was to inspire with courage and faith the person to whom he carried the message. We first hear of Gabriel in the eighth and ninth chapters of *Daniel,* when he interprets the prophet's vision of the ram and the he-goat, and later brings the explanation of the seventy weeks.

In the New Testament he announces to Zacharias the birth of John the Baptist, *Luke* I, 19, and to Mary the birth of Christ, *Luke* I, 26. The announcement of Christ's birth to the Virgin Mary by the angel Gabriel has been represented in art by many great masters. These paintings, which bear the name *The Annunciation,* are in many famous galleries of Europe. The best are those of Murillo, in the Madrid and Seville museums; of Fra Angelico, in the Madrid Museum; of Fra Bartolommeo, in the Louvre; and of Titian, in Scuola di San Rocco, Venice. See ANNUNCIATION, THE.

GADFLY. See HORSE FLY.

GADS'DEN, ALA., the county seat of Etowah County, situated in the northeastern part of the state, fifty-six miles by rail northeast of Birmingham. It lies to the southwest of Lookout Mountain, and is on the Coosa River and on the Chattanooga Southern, the Louisville & Nashville, the Southern, and the Nashville, Chattanooga & Saint Louis railroads. In 1910 the population was 10,557; in 1916 it was 14,642, by Federal estimate. Gadsden is in the vicinity of rich coal and iron-ore mines and yellow-pine forests, and has important trade interests. The industrial establishments of the city include steel mills, lumber mills, wood-working plants, blast furnaces, foundries, machine shops, car works and cotton mills. The city has a marble Federal building and attractive churches and schools. Gadsden was settled about 1845 and incorporated in 1867.

GADSDEN PURCHASE. On June 30, 1854, an international treaty of sale was ratified wherein the United States purchased a tract of land south of the Gila River in Arizona from Mexico for $10,000,000. James Gadsden, United States minister to Mexico, conducted the treaty negotiations with Santa Anna, and the sale met with so much opposition in Mexico that Santa Anna was banished from his country the following year. The purchase was made to settle a dispute over the boundary line between Mexico and the United States, and by it the latter country acquired 45,535 square miles of territory.

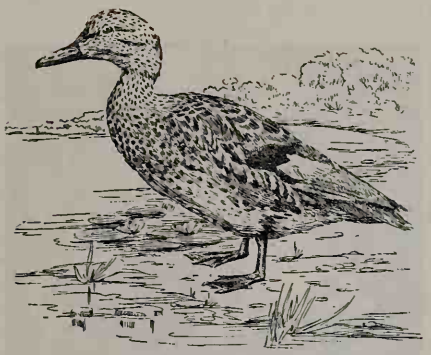
THE GADSDEN PURCHASE

GADSKI, *gaht'ski,* JOHANNA W. TAUSCHER (1872-), a German soprano, whose powerful voice and wonderful dramatic ability have won her fame in many Wagnerian rôles. She was born and educated in Prussia, and after making her debut in Berlin at the age of seventeen as Nudine in Lortzing's opera of that name, she was engaged there to sing during each season for the next four years. In 1892 she married H. Tauscher, an officer in the Austrian army, but continued her public work. After touring in Holland and Germany she made her debut in New York at the Metropolitan Opera House in 1895, under Walter Damrosch. From that time, when she sang as Elsa in *Lohengrin,* her fame has been secure. In 1898 she joined the Metropolitan Opera Company, since which time she has sung in nearly every large city in Europe and America. Her audience is always thrilled by her deep, rich voice and commanding presence as well as by her power to enter into the personality of the character which she portrays in the opera. The kingdom of Bavaria presented her with a gold medal for art and sciences.

MADAME GADSKI

GAD'WALL, or **GRAY DUCK,** a favorite game bird esteemed for the table on all continents. It is black and white, marked with brown, and is from twenty to twenty-two

inches long, not quite as large as the mallard, which it resembles in voice and habits. Shy and fearful of enemies, it sleeps in the grasses of shallow lakes and ponds in midday, and feeds during morning and evening twilight on grains and small water animals. In its grassy



THE GADWALL

nest it lays eight to twelve creamy-white eggs. In America it breeds from Southern British Columbia, Central Alberta and Central Keewatin south to states north of Kentucky, migrating in winter as far south as the Gulf States. To sportsmen of the Atlantic coast, however, this bird is practically unknown. See DUCK.

GAEL, *gale,* the name of that branch of the Celtic race inhabiting the Highlands of Scotland, Ireland and the Isle of Man. The Highlanders of Scotland call themselves the Gaels of Albion, while the Celts of Ireland style themselves the Gaels of Erin. The term *Gaelic* is applied by some to the Irish language in general, but it is usually restricted to the Celtic dialect spoken in the Highlands of Scotland.

GAGE, THOMAS (1721-1787), an English general who became famous as the colonial military governor of Massachusetts. He was born at Firle, in Sussex, received a lieutenant's commission in the English army in 1741 and accompanied Braddock to America in 1754. Gage was with that general when he marched his army through the wilderness as though he were on a parade ground and was ambushed by the Indians. He raised a regiment of troops in 1758 and commanded it in the Ticonderoga siege under Amherst, who made him governor of Montreal in 1760. From 1763 to 1772 he was chief of the English forces in America, but later returned to England.

In 1768 he was ordered to return to Boston for stricter enforcement of the Boston Post Bill and Stamp Act, as King George had discovered that money was not coming in fast enough for the support of his army in America. He found the Bostonians undaunted. His troops took delight even in demolishing the snow forts and skating places of the small boys of the town. When the latter could stand it no longer they called in a body on the general and demanded that he make his soldiers let their playgrounds alone. He complied with their request, adding, "even the children make demands for their rights." The first battle of the Revolution was fought through his order to seize the military stores at Concord, and when, after the Battle of Bunker Hill in 1775, the British were nearly conquered, Gage was recalled to England and Howe was assigned to his command.

GAILLARD, CUT, the name of the former Culebra Cut. See PANAMA CANAL.

GAINESVILLE, *gaynz'vil,* FLA., the county seat of Alachua County, a favorite winter resort for invalids, especially for those with diseases of the lungs. It possesses a certain historic interest, as it is in the old Seminole Indian territory, and it has such show spots in its neighborhood as Devil's Mill Hopper, Newman's Lake and Alachua Sink, which is now a stretch of grassy prairie, now a clear, shallow lake. The University of Florida, one of the newest of the state universities, is located here, and there are yearly sessions of the Chautauqua and of the Florida Winter Bible Conference.

The city is seventy miles southwest of Jacksonville, on the Seaboard Airline, the Tampa & Jacksonville and the Atlantic Coast Line railroads. It is of importance because one of the richest sections of the phosphate mining region lies but fifteen miles away, while oranges, grapefruit, melons and sea island cotton are grown in the vicinity. The electric light plant and the water works, which bring the city water from one of Florida's numerous springs, are owned by the municipality. Gainesville was founded about 1850, incorporated as a town in 1869 and given its city charter in 1907. Population, 1910, 6,183.

GAINSBOROUGH, *gaynz' b'ro,* THOMAS (1727-1788), an English portrait painter famous for his wonderful, cool, fresh coloring and his power for portraying personality. That he had many fashionable beauties as clients is well shown in *Mrs. Siddons* or the *Duchess of Devonshire,* two of the most popular of the 220

portraits which he painted. He was born of middle class parents in Sudbury, Suffolk. As a boy he often played truant from school that he might sketch; in this he showed such remarkable talent that his father sent him to London at the age of fifteen to study. After an unsuccessful attempt to establish a studio in that city he returned to his home town in 1745, where he married Margaret Burr. They soon moved to Ipswich, where for fourteen years Gainsborough worked steadily, painting landscapes as well as portraits, but when in 1760 he moved to Bath, orders were heaped upon him for portraits, until he acquired such a reputation that George III, upon hearing of his return to London in 1774, invited him to paint portraits of the queen and himself. All the fashionable world followed the king's example, which resulted in great prosperity for the artist, which did not abate during his life.

In 1768 Gainsborough became one of the thirty-six original members of the Royal Academy, but four years before his death he withdrew all his pictures because he did not like their hanging-places. Although he rarely sold his landscapes, he painted for the love of the task gloomy forest shades or rough broken country; *The Watering Place,* in the National Gallery, London, is a characteristic example. Of all his portraits, *The Blue Boy* is considered the best in its wonderful coloring, as well as in its airy and birdlike effect, but many others such as *Lady Ligonier, Perdita Robinson* and *Mrs. Graham* are equally as well known. The famous Gainsborough hat has been worn at various periods since he made it so popular.

GAL'AHAD, Sir, in the legends of King Arthur, was the noblest of the Knights of the Round Table, and the one who had the most important part in the quest for the sacred cup from which Christ drank at the Last Supper (see Holy Grail). Sir Galahad is pictured in art, narrative and poetry as the type of ideal manhood, set apart from other men because of his wonderful strength and purity. This conception finds appropriate expression in the familiar lines from Tennyson's *Sir Galahad:*

> My good blade carves the casques of men,
> My tough lance thrusteth sure.
> My strength is as the strength of ten
> Because my heart is pure.

The different versions of the Sir Galahad legend vary in many details. He is represented as the son of Sir Launcelot and Elaine, and as created by enchantment. In the stories of Sir Thomas Malory (which see), Sir Galahad, Sir Bors and Sir Percival are permitted to see the Holy Grail, after which the soul of Sir Galahad departs to heaven. "Then it seemed to the two knights that there came a hand from heaven and bore away the holy vessel. And since that time there was never any man so bold as to say he had seen the Holy Grail."

SIR GALAHAD

Drawn from the painting by Watts. Ellen Terry, the actress, was the model for the Galahad of the picture while she was the wife of Watts.

In Tennyson's *Idylls of the King,* Sir Galahad, on the last day of his quest, saw rising up before him, and stretching out toward a great sea, a bridge of a thousand piers, each of which, as he crossed, became a sweeping mass of flame. When he had passed far out on the great sea he was drawn into a celestial city whose spires and gateways gleamed white like pearls, and over which, in a mist of wondrous beauty, floated the Holy Grail.

GALAPAGOS, *gah lah' pah gos,* **ISLANDS,** a group of small volcanic islands in the Pacific Ocean, belonging to Ecuador. They lie directly on the equator and are about 600 miles

from the mainland. In 1858 these islands were explored by Charles Robert Darwin (which see) during the voyage of the *Beagle,* and they figure largely in his writings on the evolution of animals. They are peculiar in having almost no species of animals in common with South America. There are great numbers of birds, and tortoises of huge size are numerous. Spanish explorers named the group Galapagos, which means *tortoise.* Rats and mice were found by Darwin, but he was convinced that these animals had been introduced by ships of buccaneers who formerly made the islands their headquarters.

The total area of the islands is 2,400 square miles, more than half of which is occupied by the island of Albemarle. Turtles form the chief product. Sugar is grown and cattle-raising flourishes. The United States government endeavored to lease the islands for a naval station in 1911, but the negotiations failed. Population, about 400.

GALATE'A, the sea nymph of classic mythology whose story inspired Raphael's wonderful fresco *Triumph of Galatea,* in the Villa Farnesina at Rome, Handel's melodious secular oratorio, *Acis and Galatea,* and works of numerous poets and sculptors. She was the daughter of Nereus and Doris and has often been called the *queen of the sea.* Ugly, one-eyed Polyphemus loved her, but she gave herself to the Sicilian shepherd, Acis. Enraged at this, the monster, surprising them one day, crushed Acis beneath a rock, so turning him into a stream, which flowed to the sea to meet the beloved Galatea. The story of another Galatea is told under the title PYGMALION.

GALATIA, *ga la'shi a.* In 277 B.C. Nicomedes, king of Bithynia, invited three tribes of Gauls to aid him in conquering his brother. After accomplishing this the Gauls settled in central Asia Minor, which territory received the name Galatia from them. It was bounded on the east by Cappadocia, on the west by Phrygia, and did not reach the sea-coast at any point. The Gauls shunned the cities as places of residence and occupied the country, but they exacted tribute from the inhabitants of the cities. In 189 B.C. the Roman consul, assisted by Eumenes, king of Pergamum, partially conquered them, but in 26 B.C. Augustus made their country a Roman province. The apostle Paul visited Galatia twice (*Acts* XVI, 6; XVIII, 23) and later wrote a letter to the people of the country, known as Paul's *Epistle to the Galatians.*

LOCATION MAP

Epistle to the Galatians. When the Apostle Paul heard that the Jews had tried to make the Galatians think that he was not an apostle of God with a divine message, he wrote a letter to them. It will be known as long as the world stands as the *Epistle to the Galatians,* and is the ninth book of the New Testament. After expressing surprise that the people have so soon abandoned him and the Gospel, Paul defends himself against unjust criticism and warns them against those who wish them to keep the Law of Moses. He tells them to be kind to those who have done wrong and to help each other, guiding and encouraging them to follow Christ and His teachings.

GAL'BA, SERVIUS SULPICIUS (3 B.C.-A.D. 69), was a Roman emperor who came of a noble and wealthy family, and in his early years gave promise of remarkable ability. As general in Germany and proconsul to Africa he conducted successful campaigns which brought him triumphal honors. He then retired from public life until A.D. 61, about the middle of Nero's reign, when the latter appointed him general in Spain. There he incurred the displeasure of the emperor, who secretly ordered him to be assassinated. Hearing of this, Galba revolted, and on the death of Nero in A.D. 68 assumed the title of Caesar and hastened to Rome. His reign was short, as he soon became unpopular because of his weakness and miserly ways; in an attempt to quell a revolt he was attacked and slain.

GA'LEN, or GALE'NUS, CLAUDIUS (A.D. 130-200), a celebrated Greek physician and the most versatile writer of his day on medical subjects. He is said to have written 500 treatises on medicine, logic, grammar and ethics. Only eighty-three of those attributed to him are now acknowledged as genuine; some of the remainder are doubtful and others spurious. Galen was so successful as a physician that he earned the name of *wonder worker.* He was appointed physician to the emperor Marcus Aurelius, and, later, to his son and successor, Commodus. Until the sixteenth cen-

tury Galen was regarded as the highest authority on matters relating to anatomy and physiology.

GALE'NA, or **LEAD GLANCE,** a mineral which is found in large quantities and forms the chief ore from which lead is extracted. Galena is a compound or sulphide of lead, and usually contains about eighty-seven parts lead and thirteen parts sulphur; the ore also contains small amounts of silver, antimony, zinc, iron and bismuth. When the proportion of silver is high it is known as argentiferous galena. The ore is usually found in large cavities or chambers of limestone. Galena is a soft and brittle mineral, with a bluish-gray color, like that of lead, but brighter. In the United States galena is abundant, occurring in large quantities near Galena in Illinois, in Colorado, Idaho, Montana, and in smaller quantities in Iowa, Missouri and Wisconsin. It is also found in Mexico, England and Australia. Coarsely grained galena is used for glazing pottery, and is known as *potters' ore*. See LEAD.

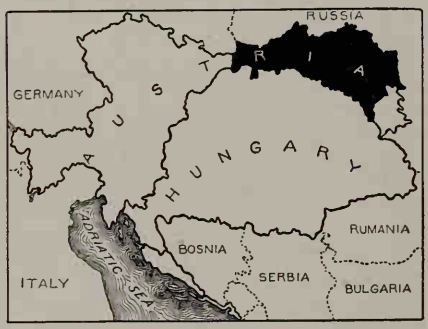
GALESBURG, ILL., the county seat of Knox County, in the northwestern part of the state, forty-two miles northeast of Burlington and 163 miles southwest of Chicago. It is on the Chicago, Burlington & Quincy, and the Atchison, Topeka & Santa Fe railroads, and has interurban electric lines to Monmouth, Abingdon, Knoxville and East Galesburg. The area of the city is nine square miles. The population, which in 1910 was 22,089, was 24,276 in 1916, by Federal estimate.

Galesburg is an important educational center; it is the seat of Knox College (which see), a non-sectarian, coeducational school, Lombard College (Universalist) and Corpus Christi Lyceum, Saint Joseph's and Saint Mary's academies (Roman Catholic). The city has a Federal building, erected at a cost of $100,000; a Carnegie Library, state armory, Y. M. C. A. building, Galesburg Club, Masonic Temple, two hospitals, several fine churches and Standish and Lincoln parks.

The city is a market for the rich farming country surrounding it. It is an important division point on the Chicago, Burlington & Quincy Railroad, a road employing 2,500 people in its shops in the city and owning a passenger station and grounds worth $500,000. Among the industrial enterprises are a paving brick plant (producing annually 100 million paving bricks), stockyards and manufactories of boilers, engines, farm machinery and implements, overalls, mittens, typewriters, etc. The city has important wholesale interests.

A group of pioneers from New York settled here in 1836. They were led by Rev. George Washington Gale, a Presbyterian clergyman, who was desirous of organizing a school for the ministry in the West, a purpose realized in the founding of Knox College. Before the War of Secession, Galesburg was an important station of the "Underground Railroad" (which see). It was granted a city charter in 1857. One of the famous Lincoln-Douglas debates was held on the grounds of Knox College in 1858. F.R.H.

GALICIA, *ga lish' i a,* the largest of the Austrian crownlands, or provinces, is bounded on the north and east by Russia, on the south and southwest by Hungary, on the southeast by the Austrian province of Bukowina and on the



LOCATION OF GALICIA

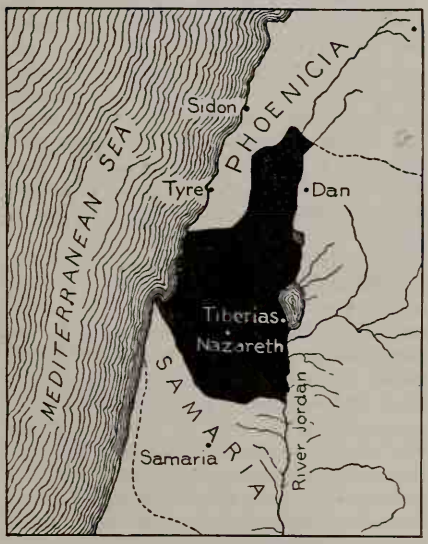
west by Silesia. It occupies the northern slopes of the Carpathian Mountains, covering an area of about 30,300 square miles. Though the agricultural industry is not fully developed, Galicia has the largest area planted to potatoes in all Austria, and seventy-seven per cent of the people engage in farming for a living. Wheat, rye, barley, oats and garden vegetables are raised in large quantities, the supply of cereals being more than is needed for home consumption.

Salt, coal and petroleum are the chief mineral products; some of the richest petroleum fields in Europe are found in the Carpathian range, and the rock-salt deposits of Wieliczka are famous. The country is drained by the Vistula, Dniester, Pruth, San, Dunajec and Bug Rivers and is noted for its numerous mineral springs. The climate is severe, the short summer being intensely hot and the cold of winter bitter and penetrating. Lemberg, the capital,

has a population of over 206,000; the next city in size is Cracow, with 154,000 inhabitants.

Galicia was a part of Poland (which see) until the first partition of the country, in 1772. It became a permanent possession of Austria at the close of the Napoleonic wars. During the War of the Nations (which see) it was the scene of terrible fighting between the Russian and Austro-German armies. Though overrun by the Russians and held by them until the spring of 1915, the crownland was reconquered by the opposing forces in their spectacular drive toward Warsaw. One of the outstanding features of this campaign was the assault on the fortified town of Przemysl, which surrendered to the Russians in March, 1915, and was recaptured by the Austro-German armies the following June. Lemberg also was the center of desperate fighting. Population of the crownland, 1912, estimated at 8,160,780.

GAL'ILEE, from the Hebrew word *galil,* meaning a *circle,* was at the beginning of the Christian Era the most northern division of



LOCATION OF GALILEE

Palestine, lying between the River Jordan on the east and the Mediterranean Sea on the west. It is now included in poverty-stricken, misgoverned Turkish Syria. It has a world-wide religious interest, which it will never lose, for Nazareth, Cana, Nain and others of its cities were the scenes of many important events during Christ's ministry on earth. The inhabitants of this locality, on account of their ignorance, peculiar dialect, and rather lax religious sentiments, were scorned by the ancient Jews, who, in derision, referred to the Christians as "Galileans." After the destruction of Jerusalem, however, the formerly despised region harbored many Jewish refugees, and became the center of a number of schools for the education of Rabbis.

Sea of Galilee, in Biblical history also called the LAKE OF GENNESARET and the SEA OF TIBERIAS, is an oval-shaped body of water in the north of Palestine. Through it flows the River Jordan. No other sea or lake in all history has held for so many hundreds of years the reverent attention of the Christian world, for it was intimately associated with the lives of Christ and His disciples. The northern part is the section associated with events in the Master's life, such as the walking on the water, the draft of fishes, the stilling of the tempest, and many other demonstrations of His divinity.

It is nineteen miles long by six miles broad, and is supposed to have been formed by volcanic forces. While it is fed by many warm and salty springs, its waters are clear, cool and refreshing. Once there were nine flourishing cities on its shores, and it was the center of an extensive fishing industry, but its vicinity is barren and practically deserted. Only two of the towns which flourished in Bible times yet survive—Magdala and Tiberias—but these are now almost in ruins.

GALILEO, *gal i le'o* (1564-1642), an Italian astronomer and mathematician, one of the world's original thinkers, whose investigations and discoveries have made him the creator of experimental science. He was the first to see clearly the unchangeable relation between cause and effect, and his service to the progress of learning is memorable and enduring. Galileo, the name which he bears by virtue of custom, is a shortened form of his real name, GALILEO GALILEI, which he did not like.

GALILEO

He was born at Pisa, and as a youth began to study medicine and the principles of Aris-

totle's philosophy in the university of that city. Not content to follow the beaten path of learning, at the age of eighteen he made an important discovery quite outside his regular course of study. The great lamp hanging from the roof of the cathedral at Pisa was one day accidentally set in motion, and as Galileo watched it swinging to and fro he was so impressed by the regularity of its movements that he conceived the idea of a simple pendulum used for the measurement of time. This discovery he turned to good account years later in the construction of a clock for astronomical purposes.

About the same time he abandoned the study of medicine for that of mathematics, a subject which opened up to him a new field of research that gave him untold delight. Though for lack of funds he was obliged to leave the university in 1585, he continued his mathematical studies in private, the first results of his investigations being his invention of a balance for weighing substances in water. By 1589 his achievements had won him such renown that he was appointed professor of mathematics in the University of Pisa, where he remained for two years. During this period he discovered the law that all falling bodies, regardless of their weight, travel through air with the same rate of speed. Galileo proved the truth of his theory by dropping balls of different weights from the leaning tower of Pisa, but his success only brought him into disfavor with the followers of Aristotle, whose faces were turned toward the past, and he found it advisable to resign his professorship in 1591.

The following year he accepted an invitation to lecture on mathematics in the University of Padua, and there he remained for eighteen years. His sojourn at Padua was a period of triumph and prosperity, and students from all parts of Europe came in vast numbers to hear his lectures. He was then at the height of his creative powers. In 1597 he invented the sector, a form of compass still used in geometrical drawing, and about the same time he constructed the first thermometer. Though he was not the actual inventor of the telescope, he was the first to make extended and practical use of it, and when in 1609 he began to sweep the starry heavens with an instrument of his own making, he opened up a wonderful era in modern astronomy.

He discovered that the moon was not a smooth sphere shining by its own light, but that its surface was marked by valleys and mountains and that it gave out only the light which it reflected. Brushing aside the fables and superstitious tales concerning the nature of the Milky Way, he declared that it was a great field of myriad individual stars. In 1610 he made his crowning discovery of the four satellites of Jupiter, which he named the Medicean stars. In the same year he observed the peculiar form of Saturn, the rings of which were recognized several years later. He also detected the movable spots on the sun, inferring from their regular advance from east to west the rotation on its axis and the inclination of that axis to the plane of the ecliptic.

In 1610 Galileo was invited by his friend and patron, the Grand Duke of Tuscany, to establish himself at Florence as his official mathematician and philosopher, and soon after he made observations of the phases of Mercury, Venus and Mars. The following year he visited Rome, where he was received with high honors, but he was then just entering upon a period of discord and disappointment. His publication of a treatise on the sun's spots, in which he openly stated his belief in the theory of Copernicus (see COPERNICUS, NICHOLAS) that the earth moves around the sun, brought him into trouble with the Church authorities, and in 1632 the appearance of his great masterpiece, *A Dialogue Concerning the Two Great Systems of the World,* caused him to be summoned before the Holy Office (see INQUISITION).

After a long trial he was ordered to renounce his scientific theory and was sentenced to an indefinite term of imprisonment. The sentence was not strictly enforced, however, as he was given permission to reside first at Siena, and later at Florence, where he died. His interest in his labors continued to the end, even when, stricken with blindness, he could no longer look upon the wonders of the earth and sky. He was buried in the Cathedral of Santa Croce, at Florence, where a great monument has been erected in commemoration of his imperishable services to the cause of learning.

Related Subjects. The name of Galileo is forever associated with the following, and the reader is referred to the descriptive articles:

Falling Bodies	Pendulum
Gravity, Specific	Telescope

GALL, *gahl,* FRANZ JOSEPH (1758-1828), the founder of the system of phrenology, was born at Tiefenbrunn, Baden, Germany. He studied and practiced medicine in Vienna.

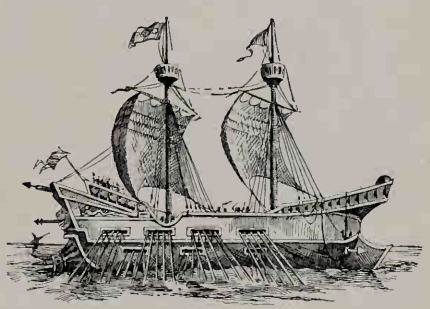
Having made an exhaustive study of the structure and functions of the brain, he became convinced that each of the various faculties of the mind had a special seat in the brain, and that the shapes of men's heads determined their mental and moral characteristics (see PHRENOLOGY). In 1796 he began a series of lectures at Vienna, but the ideas he advanced were so contrary to accepted theories concerning the mind that the Austrian government forbade his continuing his lectures in 1802. In 1807 Professor Gall went to Paris with his pupil and associate, Dr. Spurzheim. There he gained a successful practice and was also active in circulating his theories. Gall's system of phrenology at one time had wide acceptance, but modern research has shown that it is physiologically unsound.

GAL'LATIN, ALBERT (1761-1849), an American financier, statesman and ethnologist, was born in Geneva, Switzerland. He was graduated at Geneva Academy in 1779 and a year later came to America and was for a time teacher of French in Harvard College. In 1786 he removed to Fayette County, Pa., became a member of the state legislature, where he was active in opposition to the Federal excise law (see WHISKY INSURRECTION), and was elected to the United States Senate in 1793. However, he was declared ineligible to hold the latter office, it having been less than nine years since he became a naturalized citizen. He served in the House of Representatives from 1795 to 1801 and from that time until 1813 was Secretary of the Treasury, becoming such an eminent financier that a marked reduction was made in the national debt.

In negotiations which concluded with the Treaty of Ghent he rendered important service and was rewarded by appointment as minister to France, which post he held from 1816 to 1823. In 1826 he was sent to London as minister and on his return settled in New York and became interested in the problems of finance and education, and also took an active part in the founding of the University of New York. He was the first president of the Ethnological Society of America, which was founded through his efforts in 1842. He wrote several valuable essays on various phases of this subject. His published works include *Notes on the Semi-Civilized Nations of Mexico, Yucatan and Central America* and *The Indian Tribes East of the Rocky Mountains.*

GALL BLADDER, a small, pear-shaped pouch on the under side of the liver, in which bile is stored. It is about four inches long and two inches in diameter, and can hold about an ounce and a half of fluid. The stem, or neck, of the gall bladder connects with a tube (the *cystic duct*) which enters the *hepatic duct,* the two combining to form the *common bile duct.* When digestion takes place bile flows from the liver through the hepatic duct into the common duct and empties into the duodenum, the first division of the small intestine; during the interval between meals this fluid passes into the common bile duct, but is kept out of the intestine by a small muscle which guards the opening into the duodenum. It therefore flows backward into the cystic duct and from that tube into the gall bladder, where it remains until needed. If the bladder becomes inflamed by disease germs, small hard masses form inside of it. These are the *gall stones* that cause such severe attacks of pain when they pass through the bile duct into the intestine; in many cases they have to be removed by a surgical operation. See LIVER; BILE.

GALLEY, the ancient ship of the Mediterranean merchantmen, was a long, single or half-decked vessel with low free-board, propelled principally by oars but also having masts for sails. The term is generally descrip-



A GALLEY

tive of the later Roman and Grecian war-vessels of various types, the motive power of which was the oar, but it more particularly applies to the war craft of the Middle Ages, which survived in the Mediterranean navies after the adoption elsewhere of larger ships of war propelled entirely by sails. Ancient Greek vases show many illustrations of the *bireme,* or galley with two rows of oars, whose invention marked an important advance in naval construction, but it was the *trireme,* or galley with three rows of oars, which was the chief

battleship of Greece during its period of glory. The number of oars varied, some vessels carrying twenty-five on either side, and others as many as thirty-two, each being worked by several men, originally by slaves or prisoners of war and later by condemned criminals. The last great naval battle in which galleys figured was that of Lepanto, in 1571.

GAL'LINULE, a family of water birds with habits similar to those of ducks, coots and rails. American species are commonly called *mud-hens,* the family name originating from the Latin word for hen. European species are known as *water-* or *moor-hens.* Although their flesh is not good, these birds are often shot for sport. They are about a foot long and though not web-footed are excellent swimmers, for their long slender toes are furnished with a narrow membrane. Like rails, they have a horny frontal shield. These birds are timid and during the daytime remain concealed in tangles of reeds and grasses of lakes and meadow-brooks, but at twilight they may be seen running gracefully over lily-pads, or diving for their food of snails or water plants.

GALLINULE

There are two American species of gallinule. The *purple* gallinule, olive-green above, with head and lower parts a beautiful purplish blue, is never seen north of Texas, Tennessee and South Carolina, but breeds and winters southward into South America. The *Florida* gallinule, seen from Ontario to Brazil, is brownish-olive above and greenish-black beneath, with a red bill. It lays its eight to eleven eggs, which are buff, spotted with brown, in a nest of dry grass and weeds. See RAIL.

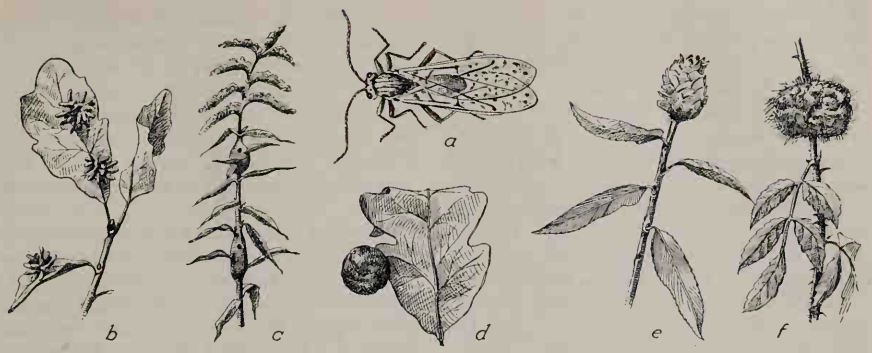
GALLIPOLI, *gal leep'o lee,* a long, narrow and mountainous peninsula, also a town of the same name, in the Turkish province of Adrianople. The peninsula separates the Dardanelles from the Gulf of Saros, and during the War of the Nations, in 1915, was the scene of terrific struggles between the Turks and Franco-British troops, in which the latter sought the capture of Constantinople. The town is at the northeastern extremity of the Dardanelles, 128 miles from Constantinople and ninety miles from Adrianople. It is not of any great commercial importance, and although once fortified and a center of industry, it is now dirty, dilapidated and neglected. It has two harbors, one of which has long been used as a station by the Turkish fleet.

The peninsula is extremely fertile, and corn, oil and wine are produced. The wine industry is carried on under difficulties, the Turkish government having imposed a tax of fifty-five per cent on all exports of wine, which led to the abandonment of many flourishing vineyards. During the Crimean War in 1854 allied armies of France and England landed on the peninsula of Gallipoli as protectors of the same Turkish power which in 1914 they determined to drive out of Europe. For map, see DARDANELLES. See, also, WAR OF THE NATIONS.

GALLIUM, *gal'ium,* a chemical element, discovered by spectrum analysis in 1875 by the French chemist Lecoq de Boisbaudran in the zinc ore found at Pierrefitte, in the Pyrenees Mountains. It is named after *Gallia,* the ancient name of France. Gallium is a rare metal, of grayish-white color, fairly hard, that may be hammered into thin plates which can be bent several times without breaking. It melts by the mere warmth of the hand into a silvery white liquid, its melting point being 86° F. Its general properties are similar to those of aluminum. Gallium combines with oxygen to form oxides, and with chlorine to form several kinds of chlorides. Its chemical symbol is *Ga.* See CHEMISTRY.

GALLON, *gal'un,* a liquid measure with a capacity of 231 cubic inches. It is divided into four liquid quarts, each quart being equal to two pints and each pint equivalent to four gills. The gallon is standardized in the United States, Canada and England. Any cylindrical body six inches in height and seven inches in diameter will contain exactly one gallon. In England an *imperial gallon* is also used; this measure has a capacity of 277.420 cubic inches. See WEIGHTS AND MEASURES.

GALLS, *gawlz,* unnatural growths on roots, stems, buds, leaves or flowers, plants or trees, produced by the presence of larvae (young) of insects, or in rarer instances by fungi, slime molds, algae, bacteria or worms. They vary in size from the merest swellings to fruitlike growths several inches in diameter. Some



VARIOUS FORMS OF GALLS AND A GALL FLY

(*a*) Gall fly; (*b*) galls on leaf of California white oak; (*c*) stem of goldenrod, showing spherical gall above, made by the larva of a fly, and below, a spindle-shaped gall made by the caterpillar of a moth; (*d*) oak apple; (*e*) willow cone gall; (*f*) mossy rose gall.

contain but one larva, others have several—in some cases a dozen—larvae. In appearance there is great variety, from those which are smooth and shining to rough and hairy varieties; from trumpet-shaped, rosette or starlike forms to ball or kidney shapes. Birds, squirrels and insects tear open these strange little homes to feed upon the larvae within, and to protect them from their ruthless enemies Nature has provided various interesting devices. Some secrete juices to trap intruding insects, others are protected by color, and still others are bitter with tannin.

Many gall-producing insects are extremely injurious to vegetation, as the Hessian fly, which costs the United States and Canada millions of dollars worth of wheat crops each year; or the destructive grape-vine phylloxera, or the clover-seed midge. The small, dark, four-winged gall-fly, however, is of some value, as it deposits its eggs in the leaves and twigs of various plants and trees, and when these are deposited in oaks the familiar and valuable spongy white, green or blue oak apples appear. From them are obtained tannin for leather tanning; they are also made into ink and dyes and are frequently used in medicine. The galls of commerce are gathered chiefly by peasants in Aleppo, Italy, formerly the center of that trade, and in Persia, Cyprus, Asia Minor and Syria. Although oak apples are abundant throughout America, the gathering would be too costly. The pioneers used them for ink and dyeing, and some of the oldest American documents show the bright, practically permanent ink of oak galls.

Related Subjects. The reader is referred to the following articles in these volumes:

Algae	Insects
Bacteria and Bacteriology	Phylloxera
Fungi	Slime Molds

GALS'WORTHY, JOHN (1867-), one of the foremost of twentieth century English novelists and dramatists, noted for his keen studies of social problems. Galsworthy is usually regarded as a writer with a purpose; nearly all the work of his mature years deals with some evil or injustice against which he protests. Thus his play *Justice* is a bitter protest against the practice of placing convicts in solitary confinement. Aside from its success as a play it achieved the desired effect in that it called public attention to the horrible results of solitary confinement and actually induced the British government to abolish this form of punishment. Galsworthy's efforts to secure reforms, however, do not mean that he has sacrificed artistic workmanship to propaganda; his novels and plays, on the contrary, are artistically successful, and it is likely that his work would not be so successful in securing reform if it were not also literature of permanent value.

JOHN GALSWORTHY

It is as a dramatist that Galsworthy is perhaps best known, although his first piece of writing was a novel, *Jocelyn,* published in 1898.

Villa Rubein and *A Man of Devon*, his next novels, like *Jocelyn*, received little notice from the public, but after 1904 his talent was recognized. In that year appeared *The Island Pharisees*, a study of English life. In rapid succession thereafter he wrote *A Man of Property*, satirizing the ways of the great capitalists, *The Country House*, which deals with the life of the landed gentry, and *Fraternity*, which is largely a study of class feeling. His later books include *The Patricians*, the *Inn of Tranquillity* and *The Dark Flower*, a morbid tale.

His plays, nearly all of which have been produced, include *Joy*, *Strife*, *The Silver Box*, *The Pigeon*, *The Eldest Son*, *The Fugitive*, *The Mob*, and *The Little Dream*, the last-named a poetic, fantastic little story which is very different from most of his tragic plays. In 1918 he refused the honor of knighthood.

GALT, Sir Alexander Tilloch (1817-1893), a Canadian financier and statesman, who was responsible for the introduction of the decimal system of currency into Canada. He was born in London, England, but when he was eighteen years of age he was sent to Canada in the employ of the Canada Land Company, of which his father was superintendent. He remained in the service of the company for twenty years, and during the last twelve years of the period was its chief commissioner. He was at one time also interested in the promotion of railways and was a partner in the firm which constructed the Grand Trunk Railway from Toronto westward to Sarnia.

SIR ALEXANDER GALT

Galt entered political life in 1849 as a member of the Canada assembly. Though a Liberal, he opposed the Rebellion Losses Bill, the chief measure of his party. He retired from the assembly before the end of the year, but reëntered it in 1853, and for twenty years thereafter was the leading spokesman for the English Protestants of Quebec. A man of independent views, he was never willing to give his unqualified adherence to either political party, and for that reason never had a large following. Yet so great was his reputation that in 1858 he was called on to form a ministry, a task which he declined. From 1858 to 1862 and again from 1864 to 1866, as inspector-general of finance, he did much to reduce the chaotic finances of Canada to order. In 1859 he secured the passage of a tariff act which was the beginning of a system of protection for Canadian manufactures, and in 1866 the decimal style of currency was adopted through his efforts.

Galt was one of the men whose influence led to the coalition ministry of 1864-1867 and eventually to Confederation. He became Minister of Finance in the first Dominion Ministry, formed by Sir John A. Macdonald, but resigned after a few months. In 1877 he rendered brilliant service as Canadian representative on the Anglo-American Fisheries Commission which met at Halifax. He was the first High Commissioner to Great Britain, from 1880 to 1883, being succeeded by Sir Charles Tupper. The last ten years of his life were spent in retirement. G.H.L.

GALT, a town in Waterloo County, Ontario, in the southwestern part of the province, situated on both banks of the Grand River, about fifty-five miles from its entrance into Lake Erie. Hamilton is twenty-five miles southeast and Toronto is fifty-seven miles northeast. Railway transportation is provided by the Grand Trunk, the Canadian Pacific and the Lake Erie & Northern railroads, and electric lines connect with Kitchener, Paris, Waterloo and Brantford. The first settlement was made in 1816, but the city was not incorporated until 1915; it was named in honor of John Galt, a Scotch author, father of Sir A. T. Galt. The population is chiefly Scotch, with a small mixture of English, Dutch and Germans; in 1911 it was 10,299; in 1916, estimated, 11,000.

The immediate surroundings of the city are well-wooded, and with the river, which is here spanned by the several bridges, present some picturesque scenery. Of the city's recreation grounds, Victoria Park is the largest and most attractive. Stone is largely used in the construction of the buildings, the most noteworthy being the post office and custom house, the city hall, the public library and several churches. Galt is located in a rich agricultural district, which also produces a good supply of lumber, limestone and sand. Manufactures are represented chiefly by iron and brass foundries, shoe factories and sawmills. J.MC C.

GALTON, *gawl'ton*, Sir Francis (1822-1911), an English scientist and author who is chiefly noted for his important researches in heredity,

biology and anthropology. He was educated at Birmingham and Trinity College, Cambridge. After spending about two years in the Sudan, studying native types, he started on a journey of exploration through Damaraland and the Ovampo country in Southwest Africa. His published account of his travels brought him the gold medal of the Royal Geographical Society. Becoming interested in meteorology, Galton suggested many important theories and published extensive weather charts and articles on anti-cyclones.

On the subject of heredity he held advanced views and boldly advocated the checking of the birth rate of the unfit by suitable selection of parents. He was the first to use the term *eugenics,* which has since been universally adopted. Galton was singularly versatile, quick, yet thorough, and an enthusiastic worker. His notable publications are *Hereditary Genius —Its Laws and Consequences; Inquiries into Human Faculty and its Development* and *Natural Inheritance.* Honorary degrees were bestowed on him by Oxford and Cambridge universities, and in 1909 he received knighthood. See ANTHROPOLOGY; HEREDITY; EUGENICS.

GALVANI, *gahl vah'ne,* LUIGI (1737-1798), an Italian physiologist and anatomist, the discoverer of galvanism, so named in his honor. He was born at Bologna, studied medicine there, and in 1762 began to practice. In 1765 he became lecturer on anatomy at the University of Bologna, which position he held until the year before his death, when he was deprived of his professorship because of his refusal to take the oath of allegiance to the Cisalpine Republic. Just before his death he was reinstated.

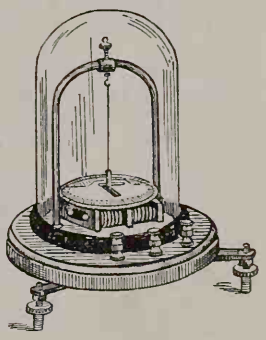
His celebrated discoveries relative to the effect of electricity upon animal muscles began with the observation of the accidental contact of the dissected legs of a frog with a scalpel which was itself in contact with an electric machine. The results of his experiments were published in 1791. See ELECTRIC BATTERY; GALVANISM.

GALVAN'IC BATTERY, the old name for electric battery. It was formerly supposed that the electric current produced by chemical action was different from that produced by friction, and the name *galvanic* was given to electric batteries in honor of Luigi Galvani (which see), the discoverer of the fact that an electric current could be produced by chemical action. When it was learned that the current generated by a battery was of the same nature as that generated by friction, the term was discarded. See ELECTRIC BATTERY; GALVANISM.

GAL'VANISM, a term formerly applied to an electric current and its effects when the current is produced by an electric battery. Originally the term was used to distinguish electricity produced by an electric battery from that produced by an electrical machine, but after it was discovered that the electricity of an electric battery and that of an electrical machine are one and the same, *galvanism* fell into disuse. The name is derived from that of an Italian scientist, Luigi Galvani (which see). See ELECTRICITY; ELECTRIC BATTERY.

GAL'VANIZED IRON, a name commonly applied to thin sheets of iron that have been coated with zinc as a protection against rust. The process is not in any way galvanic, but consists of first cleaning the iron in a warm solution of sulphuric or hydrochloric acid, and then immersing it in a bath of molten zinc and sal ammoniac. As the zinc cools it deposits crystals on the surface of the iron, giving it a mottled appearance. Galvanized iron is extensively used in corrugated and plain sheets for cisterns, roofs and many buildings. In parts of South Africa it is in such general use for dwellings that whole villages and towns are composed of houses made of this material, lined with match boarding. In Western Canada it is used for roofing, but it is unsuitable there for any other part of houses, as it affords little protection against cold. Ship's bolts, nails, screws, wire netting, fencing and telegraph wires are among the articles usually galvanized. During the South African War large cylinders of galvanized iron filled with earth and stone were extensively used for blockhouses and minor fortifications.

GALVANOM'ETER, a delicately-adjusted instrument used to detect and measure the strength of an electric current. It consists of a coil of insulated wire surrounding a magnetic needle, hung so that it is made to move by the slightest electric current sent



GALVANOMETER

through the coil. Movement occurs over the face of a dial marked off in degrees, the strength of the current being indicated by the distance over which the needle passes. In the galvanometer invented by Lord Kelvin a ray of light is reflected upon a screen from a mirror attached to the needle. The slightest movement of the needle is indicated by a movement of the light ray. Currents so weak that they would not be noticed even if passed through the human body can in this way be detected and accurately measured.

GAL'VESTON, Tex., is the greatest cotton port in the world, and it ranks next to New York and New Orleans among the cities of the United States in the value of exports and imports. It is the county seat of Galveston County, and is situated on the east end of Galveston Island at the mouth of Galveston Bay, an inlet of the Gulf of Mexico, fifty-three miles southeast of Houston and 300 miles (direct) southwest of New Orleans. Railway facilities are provided by the Gulf, Colorado & Santa Fe; the International & Great Northern; the Missouri, Kansas & Texas; the Galveston, Houston & Henderson, and the Galveston, Houston & San Antonio railroads; the city also has the Galveston-Houston electric railway. Besides steamer lines which have regular sailings to New York, there are regular communications with European, Asiatic and North and South American ports. The city is connected with the Texas mainland at Virginia Point by a reënforced concrete causeway two miles long, which spans Galveston Bay. Passage is afforded ocean steamers by a lift bridge, the largest of its kind in the world. All nationalities are represented in its population, which increased from 36,981 in 1910 to 41,863 in 1916; the latter is an estimate based on the increase from 1890 to 1900. The area, which includes Pelican Island, is nearly fifteen square miles.

Boulevards and Buildings. The residential part of Galveston suggests a typical Southern city, with its stately mansions, many of them white, luxuriant gardens, and streets lined with palms, oaks, oleanders, magnolias and jasmine. Menard Park, Sidney Sherman Park and Central Park add to the general beauty of the city. Between the sea-wall and the sea extends the beach, thirty miles long and considered the finest in the world, the bathing, fishing and boating facilities being unsurpassed. This beach is also an automobile course.

Galveston is a popular health resort in the Southwest, attracting great numbers of visitors annually. It has many notable buildings, among which are the old post office, which has been remodeled; the new Federal building; the Federal Quarantine Station; the Rosenberg Library, costing $250,000 and having an endowment of $400,000; the city hall with its beautiful park; John Sealy Hospital, which operates in connection with the state medical college; American National Insurance building; and the Hotel Galvez, built in 1912 at a cost of $1,000,000, raised by public subscription. The last-named, with the eleven other hotels, is equipped to uphold Galveston's reputation for Southern hospitality, many thousands of visitors being easily accommodated over night. There are some fine bank and business buildings and homes for orphans and homeless women.

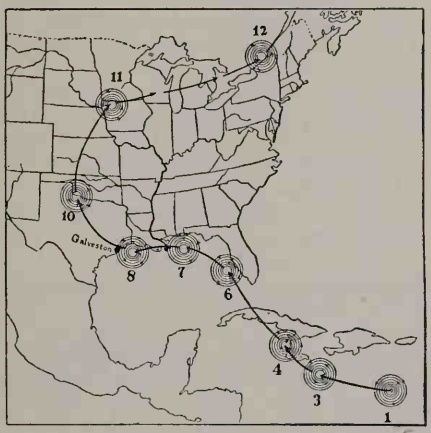
Educational Institutions and Churches. Besides its public school system, including two high schools, the city has the state medical college, a department of the University of Texas, Saint Mary's University, Ursuline Convent, a Jesuit college, a Dominican convent, Sacred Heart Academy, twelve sectarian schools and business schools. There are thirty-one churches for white and twelve for colored people.

Commerce and Industry. Galveston is the leading commercial city of Texas. Its wharf and terminal facilities have few equals in the United States, being exceeded only in size. The harbor has been improved at a cost to the United States government of $15,000,000; the granite jetties twelve miles long alone cost $8,000,000. Cotton ranks first among the exports, which also include wool, hides, grain, flour, oil-cake, oil-meal, fish-oil, lumber, provisions and fruit. The most important industrial enterprises are the Galveston Wharf Company, the cotton compress and concentrating plants and flour, bagging and rope mills. There are four export grain elevators, and several large wholesale houses.

History. In 1836 Colonel Michael B. Menard organized the Galveston City Company and purchased the site of modern Galveston from the Republic of Texas. The city was incorporated in 1839 and named in honor of Count Bernardo de Galvez, Spanish viceroy of Mexico. During the War of Secession it was captured by the Federal troops and retaken in 1863 by the Confederates, who held it until the close of the war. For many years to come the inhabitants will remember September 8, 1900, when the city was visited by the most

appalling disaster from natural causes in the history of the North-American continent. The city was flooded to a depth of from four to sixteen feet by a West Indian hurricane, which caused a loss of 8,000 lives and a destruction of property amounting to $20,000,000.

To prevent another such catastrophe, three tremendous engineering feats have been accomplished—the erection of the sea-wall, the raising of the city grade and the building of a causeway. The sea-wall is a concrete steel-reënforced battlement 17,593 feet long, sixteen



PATH OF THE HURRICANE
The figures indicate days of the month and show the rate of speed of the wind, which reached its greatest velocity at Galveston.

feet wide at the base and seventeen feet high. In raising the grade the city was lifted to a height of nineteen feet above its former level, two feet higher than the sea-wall, and during the operations, the city may be said to have walked on stilts, as houses, walks and car lines were propped up while thousands of cubic yards of sand were deposited from the Gulf of Mexico. To bring order out of chaos, several citizens at that time formed a new plan of government, and in 1901 Galveston presented to the world what is now known as the commission form of government, which has been adopted widely throughout the United States, Canada and Europe. H.H.H.

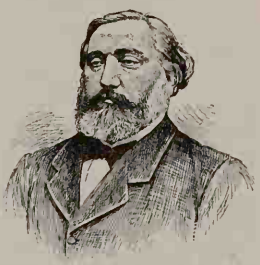
GAMA, *gah'mah,* Vasco da (1460?-1524), a Portuguese navigator, the first to sail around the Cape of Good Hope, and the discoverer of the sea route to India. He was descended from a noble family and at an early age became known as a fearless mariner. He was selected by the king of Portugal to command an expedition to find the way to India. He sailed July 8, 1497 and after visiting Calicut, returned to Portugal with reports of the boundless wealth of India. The king richly rewarded him with rank of nobility, a pension and great commercial privileges. He was named Admiral of the Indies and made a second successful voyage. In 1524 he was appointed viceroy of India and was sent out to remedy the ill effects of the misrule of the king's representatives. The same year he died at Cochin. His body was later removed to Portugal and buried with honors in Lisbon.

GAMA, GRASS, or **SESAME,** *ses' a me,* **GRASS,** a fodder grass cultivated in the Southwestern United States, Mexico and parts of Europe, but particularly adapted to the climate of Australia. The name *gama* is from that of a Spaniard who first attempted to cultivate it in Mexico. This grass is drouth-enduring, and is quickly killed by frost. From stout rootstocks its coarse, pithy, branching stems grow to a height of nine or ten feet. Its leaves, about six feet long, resemble those of Indian corn. In midsummer it bears spikes of feathery, dark purple flowers, topped with long, orange-colored anthers.

GAMA'LIEL, a Jewish doctor of the law and member of the Sanhedrin who showed his good judgment and common sense when he urged his colleagues not to persecute Peter and the other Apostles for preaching Christ to the people (*Acts* V, 34). He was the rabbi, or teacher, who taught Saint Paul in his youth and was held in the highest respect among his countrymen. For that reason they were guided by his reasoning when he said that if the Apostles' work were simply man's, it would finally come to nothing, even if they took no measures against it, while if it were of God, they could not overthrow it, for they would be fighting God. He is said to have been president of the Sanhedrin for several years, but the report that he became a Christian is without proof.

GAMBETTA, *gam bet'a,* Leon (1838-1882), a French statesman noted for his bitter opposition to monarchical government. As a lawyer he met with great success in Paris, chiefly in defending political prisoners. In 1869 he was elected to the Chamber of Deputies by Paris and Marseilles, and his republican views immediately attracted attention. He strongly opposed the policy which resulted in the Franco-German War in 1870, and led bitter attacks against the empire. He escaped from

Paris in a balloon during the siege, and established what amounted to a dictatorship at Tours. Calling on the nation to rise in a mass to overwhelm the invaders, he conducted a fierce resistance, with a determination to fight to the end. He accused Marshal Bazaine of an act of treason in surrendering Metz, and was active in securing his trial after the war. After peace was made he held office in several Ministries and became Premier in November, 1881. Resigning in 1882, he continued to exert his influence through his paper, the *Republique Française,* one of the most brilliant journals of the time. His death was hastened by a wound in the hand caused by the accidental discharge of a pistol. See FRANCO-GERMAN WAR.



LEON GAMBETTA

GAM'BIA, the most northerly of the British colonies on the west coast of Africa, covering an area of about 4,000 square miles in a long triangle, on both sides of the River Gambia. The climate is more healthful than elsewhere on the west coast, for there the malaria-carrying mosquito has been practically exterminated. The Gambia is navigable for the whole extent of the colony, and affords excellent means of transportation for internal produce. Rice, maize, cotton and ground nuts are raised for local use, and rubber, beeswax and palm oil are extensively exported. The rivers and creeks are inhabited by hippopotami and crocodiles, and lions, leopards, monkeys, wild boars and many kinds of deer are found in the forests and plains. The capital is Bathurst, on the island of Saint Mary, at the mouth of the Gambia. Most of the inhabitants are negroes, industrious, thrifty and skilful agriculturists. Population, estimated at about 163,000.

Gambia River, one of the most important rivers on the west coast of Africa, and the only one that is navigable at all times of the year for 200 miles from the sea. It rises only 150 miles inland, but winds and twists over a course of 1,000 miles before emptying its waters into the Atlantic Ocean. Mungo Park, the explorer, started his two journeys into the interior from this river in 1795 and 1805. The source was discovered in 1818.

GAMBOGE, *gam bohj'*, or **CAMBOGE,** a resinous gum derived from the gamboge tree, a native of Cambodia, Ceylon, Siam and other Far Eastern countries. The tree grows to a height of forty or fifty feet, has oval leaves like those of the laurel, and square-shaped, four-seeded edible fruit. The gamboge is obtained by making incisions in the bark of a tree in the same way that maple trees are tapped. A bamboo tube is placed so that the juice is carried off and received in cocoanut shells or other receptacles. The juice hardens on exposure to the air, becoming a dirty orange on the outside and brilliant yellow inside. It is sold commercially in hollow rolls, sticks and shapeless lumps.

Gamboge is extensively used by artists in mixing water colors, for staining wood and as a lacquer for brass. In medicine it is occasionally employed as a cathartic, but its action is harsh, causing severe griping. It is said to be effective in minute doses in cases of dropsy and apoplexy when taken in conjunction with a sedative. American gamboge, which is used for the same purposes, is obtained from a similar tree which is native to Mexico. It is somewhat inferior to the imported variety.

GAME, the general name for animals which are hunted, from truly wild beasts, such as tigers and bears, to small, helpless creatures like the rabbits and fowls.

Game Laws. There are two distinct types of game regulations, those intended to make hunting the privilege of aristocracy, and those to prevent the wanton destruction of game and the possible extermination of a species of animal life. The first are characteristic of European countries, the second, of America. In Scotland and Ireland none are permitted to hunt but the possessors of estates of a certain size or value, and a similar restriction was in effect in England until 1881. Such provisions are a survival of feudalism, of the days in which *poaching,* or illegal hunting, was an offense sometimes punished by death.

Each of the American states and Canadian provinces has its own game laws. Most of them forbid shooting except during a short period of each year known as the *open season,* and restrict the number of animals which each hunter may kill, have in his possession, or ship out of the state. Any person may secure a copy of his state or provincial game laws by addressing the game warden, at the capital. In Canada, a law of the Dominion places a rigid limit upon the export of game.

Private Game Preserves. Because of the existence of many private estates which have survived from the Middle Ages, there are in Europe large numbers of areas where game is preserved that the aristocracy may indulge in the traditional sport of hunting. In America private preserves are less common. That of the Roberval Club, in the Laurentian Mountains north of the city of Quebec, contains more than five hundred square miles of forest, and there are a number of others belonging to sportsmen in the United States and Canada which contain several thousand acres. Other private game preserves are maintained by lovers of wild life who wish to prevent the extinction of buffalo, waterfowl and other beasts and birds that are prey for the hunter, unless protected.

Game Reservations. National, state and provincial governments in America have taken steps to preserve the native *fauna* of the continent by setting aside large tracts where the animals may live unmolested. Among these are the national parks, the largest of which are the Jasper Park in Alberta, containing 5,450 square miles; the Rocky Mountains Park, in the same province, with an area of 4,320 square miles; and Yellowstone Park, in the United States, 3,348 square miles in extent. The Laurentides Park of the province of Quebec is slightly larger than the Yellowstone. Thousands of wild animals make their homes in these parks, among them elk and buffalo, deer and antelope, mountain sheep, moose, bear and beaver. The largest game reservations in the world are those of the British government in Central Africa, where the rhinoceros, the hippopotamus and other strange beasts are native. See, also, BIRD, subtitle *Government Protection of Birds.* C.H.H.

Consult Hornaday's *Our Vanishing Wild Life; Circular 87,* United States Department of Agriculture, "National Reservations for the Protection of Wild Life."

GAMES AND PLAYS. Time was, not more than a few generations ago, when play was looked upon as an almost unmixed evil—necessary at times, to be sure, but by no means to be encouraged. Children wanted to play, and most parents were not hard-hearted enough to keep them from it entirely, though looking upon it as a waste of good time which might have been far better employed in some useful occupation. Even to-day elderly persons are found who look back to their childhood almost with bitterness because of the dull work-a-day lives they were forced to lead, unrelieved by the joyous sports natural to youth. The son of a preacher of the old school declares that whenever in his boyhood he began the most innocent of plays his father called him into the house to sing, "My God, my heart I bring to Thee." This father did not understand the value of play.

At present there is danger of the pendulum's swinging too far in the other direction and of the child's having too much play, but the wise teacher or parent can regulate that matter easily. Of course, with a child, the difference between play and work is one of mental attitude—the play is often far more strenuous than are his simple tasks, and calls for more concentration, but he does it joyously because he has the play attitude toward it.

Value in Play. Why is it that the educational world, blind for so long to that particular phase of children's activities, has now come to look upon play as so important that special provision is made for it in the course of studies? And why are large cities providing public playgrounds and attendants who can teach the children interesting and healthful games? The explanation of these changes in policy is in the recognition of the truth of Froebel's statement that "Play is not trivial; it is serious and fraught with deep meaning." "If this be true," the teachers and the children's welfare committees have argued, "if play really is a serious matter, then it is worth the serious attention of grown people."

That this is true no one who has watched children at their play can doubt. In no way can a child express himself more fully than in his play. His ingenuity, his memory, his power of concentration, all of these are brought into service, while as a means of developing the social spirit and preventing undue insistence on self, competitive games are unrivaled.

Then, too, play actually helps work. Little children sit in school until their minds as well as their bodies have become tired and stiff, but a few moments of play will send them back to their tasks relaxed and refreshed, and the teacher has not nearly so much difficulty in holding their attention as before.

Aim of Play. When children play by themselves, undirected, they have no conscious aim but to "have fun." This article, however, is intended to give aid not only to children who are on the everlasting quest for "something to do," but to teachers and others who have charge of children during their play periods. The unconscious play of children is full of suggestion, and teachers must endeavor to keep themselves in the background. To know what plays or games are best and most attractive to children, careful students of childhood have devoted their best efforts to the study of those games children most delight in. To fulfil the purposes of such play-directors, games must have certain characteristics and must help the children in certain ways. Taken all together, games and plays should be:

(1) *Hygienic,* bettering in some way the circulation or respiration, and so improving the general health.

(2) *Corrective,* tending to straighten little backs that are in danger of becoming curved with too much bending over desks, to give a correct poise to a drooping head, or in some other way to correct defects in posture.

(3) *Educative,* training muscles, nerves or brain to act quickly and accurately.

(4) *Recreative,* having the one purpose of relaxing and brightening the minds of the children and so fitting them to go on with their work.

Naturally, every game cannot excel in all these points, and care should be taken to vary the games so that no one purpose may be too long insisted upon. Very seldom is it necessary for the pupil to know what the teacher is attempting to accomplish by a certain game; indeed, such knowledge often defeats the purpose. For instance, if the teacher says, "Hold up your heads and throw back your shoulders; this game is to keep you from becoming stoop-shouldered," she is certain to have but a feeble response. But if at the outset she declares that they are now to play a soldier game, and calls out, "Soldiers, Attention!" heads will be held up and shoulders straightened half unconsciously.

Games in the Schoolroom. First and foremost, the teacher should enter as far as possible into the spirit of the game, not only because she herself needs the relaxation, but because the children enjoy far more a game which they feel is interesting enough to hold "teacher's" attention, too. So far as possible the children should be allowed to choose the games, as they will then enter into them far more spontaneously.

As to methods of introducing games, the teacher needs to remember but a few simple suggestions. A game cannot be explained and played successfully at the same time, and full explanations should therefore be made before the playing starts. The explanation should be as short and simple as possible, that the eagerness of the children may not be dulled. In the playing of competitive games each side should be encouraged to do its best to win; nothing can teach children the difficult art of being good losers and the almost more difficult one of being good winners except actual participation in games. "Honor" should be made a strong point, too, and the rules of the game insisted upon. It is a well established fact that the boy who would rather lose a game than do anything in the least dishonest to win it will some day be the business man whom his associates can trust. It should be made clear that the same rules hold good for girls.

Games for Young Children

In the Schoolroom

Follow the Leader. A child who is not afraid to "start things" is chosen as the leader, and the children fall in line behind him. In and out through the aisles and around the room he leads them, making certain motions which every child must imitate. He may run or skip, step high as if he were stepping over hurdles, clap his hands, wave his arms or hold them above his head—anything which his fertile brain may devise. This is a brisk game and freshens the children up wonderfully. During this and all other games of action the teacher should throw open the windows.

Playing Train. Each child is given the name of some part of a train. Thus one may be

the wheels, one the bell, one the conductor, one the engine, and so on. They take their places in a row and run their "express train" through the aisles and around the room, each child acting out his part so far as possible. When the teacher

FOLLOW THE LEADER
(Details of the game are on page 2374.)

calls out that the train is at a station the children take their seats and another group becomes the train. Very little children find much diversion in this and it is a good recreative game

Do As I Do. A "teacher" is chosen from among the pupils and takes his place in front of the others, who stand either at their desks or in a semicircle. All except the leader then sing:

"Now, John, will you teach us
A new game to play?
We'll watch you and try to
Do just as you say."

The "teacher" performs some simple exercise in which he wishes the others to follow him, as raising his arms above his head and bending to touch the floor with the fingertips, running in place, or rowing, and the others do as he does.

I Saw. A child in each row is called on to tell of some action he has seen: "I saw a dog running," he says, or, "I saw a frog jumping," or, "I saw a swallow flying;" and all the children in the row imitate the action, while following the leader about the room. In any such play as this care must be taken to select occasionally the bashful children, who will not speak out unless they are expressly called upon.

Catch the Squirrel. This game is certain to interest the children, but it gives only one or two exercise at a time and should, therefore, not be used as often as those games which permit all the pupils to be in action at the same time. Each child blinds his eyes and lays his head upon his desk, but keeps one hand open that the child who has been chosen as "squirrel" may drop a nut into it. The child who receives the nut springs up instantly and runs on tiptoe after the squirrel, trying to catch him before he can reach his seat. If he fails to catch him, he becomes squirrel in turn.

In the Home

Games that are to be played in the home are of necessity quieter and call for fewer players than do the schoolroom games, but some of them at least should have some action. On a stormy day when children must remain within doors and they become restless in consequence, a game or two of action, played in a room with open windows, will "tame them down" wonderfully.

Ring-Toss. This is a game which has real educational value, in that it develops precision of movement and a ready response of muscles to mind. A circular stick about a foot in length—a portion of a broom handle will answer excellently—is made to stand upright by driving it tightly into a hole which has been bored in a board about a foot square and five or six rings are provided, of such size that they will slip easily over the stick. The players then take their station a few feet away and attempt to toss the rings over the stick, each player throwing all the rings and keeping count of his successful tosses. Gradually the distance between the player and the stick is increased.

The Garden Gate. All the players except one join hands and dance in circle about the one who has been chosen as "it," who meanwhile sings to them to the tune of "Here we go round the mulberry bush":

Open wide the garden gate, the garden gate, the garden gate,
Open wide the garden gate and let me through.

They then dance in the opposite direction, singing all together:

Get the key of the garden gate, the garden gate, the garden gate,
Get the key of the garden gate and open and let yourself through.

The one inside the circle then pretends to weep and sings in reply:

I've lost the key of the garden gate, the garden gate, the garden gate,
I've lost the key of the garden gate and cannot let myself through.

Still dancing round and round her the others sing:

You may stop all night within the gate, within the gate, within the gate,
You may stop all night within the gate, unless you have strength to break through.

The prisoner then rushes suddenly to the ring and throws her whole weight upon the clasped hands of two of the children, trying to break through; and if she succeeds another player takes her place in the ring.

My Lord's Toilet. Each child in the party is given the name of some article of a gentleman's dress and then all take their seats but one, for whom no chair is provided. This one, called the Valet, takes his stand in front of the rest and calls rapidly for the different articles. "My lord's up and wants his collar," he cries, when the person who represents the collar must jump up quickly, call out "Collar," and sit down again. If any player does not respond instantly he must pay a forfeit. Occasionally the Valet exclaims, "My lord's up and wants his whole toilet," when all the players must jump up and change chairs, the Valet scrambling for one also. The one who is left standing becomes Valet in turn.

Out-of-Doors

Of course, the ideal playing ground is out-of-doors; not only is the air purer, but the children are rid of the cramped feeling which

is inseparable from indoor playing, and can really stretch their muscles. Certain of the games described above can easily be played out-of-doors and some of those listed below

DROP THE HANDKERCHIEF

may be used indoors in stormy weather, if there is a considerable open space. Especially is this true of the bean-bag games.

Games with Bean Bags. A set of bean bags should be in every schoolroom and the children will usually be glad to make them. These bags should be of some strong material, bright-colored if possible, should measure about five by five inches and should be about half full of beans.

For the simplest of the bean-bag games the children form a circle about one of their number who is the "teacher." He tosses the bag to the others either in rotation all around the ring or out of turn with the object of catching some player napping. The one thus caught becomes "teacher" in turn. Then, to vary the game, the teacher may throw the bag into the air and call the name of some child who must spring forward and catch it before it touches the ground.

In another bean-bag game the children stand in two rows, facing each other. The first child in one row tosses the bag to the second in the other row, who tosses it to the third in the first row, the bag keeping its zigzag course until it reaches the end of one row, when it is tossed directly across and then back again in the same zigzag manner. Thus the children who did not have a chance to catch the bag as it passed down the line have their turn on its return journey.

Cat and Mouse. In this game the players join hands to form a circle, and stand about an arm's length apart. One player, the cat, stands outside the circle, while the mouse, the one to be caught, stands inside. Those who form the circle may raise their arms to allow cat or mouse to pass in and out of the circle, or they may hinder them by lowering their arms. When the mouse is caught other players are chosen.

Posture. The players stand in a circle, three or four yards apart, and a ball or bean bag is tossed rapidly from one to another. Each one who misses must remain as though turned to stone in the attitude in which he was when he failed, and the last to miss wins the game. He tosses the ball into the air and catches it ten times while the others retain their positions.

Drop the Handkerchief. This is always a favorite with the children and it is a good game for a large party. All the players save one form in a circle, the one taking his place outside with a knotted handkerchief in his hand. As he runs about the circle he sings:

Itisket, Itasket, a green and yellow basket,
I sent a letter to my love and on the way I dropped it, I dropped it,
A little boy picked it up and put it in his pocket.

Quietly he drops the handkerchief and runs on, trying to get around the circle and tag the player behind whom he dropped it before it has been picked up. If the player discovers it, however, he picks it up and runs with it, trying to tag the one who dropped it before he reaches the vacant place.

London Bridge. Two children join their raised hands to form a "bridge" under which the others must pass in line, the two singing:

London bridge is falling down, falling down, falling down.
London bridge is falling down, my fair lady.

With the last word the "bridge" is dropped over one player who is led aside to the tune of—

Off to prison you must go, you must go, you must go,
Off to prison you must go, my fair lady.

The prisoner is then asked to choose between two objects, one of which has been selected by each of the two "bridge-tenders," and takes her stand

LONDON BRIDGE

behind the one whose object she has chosen. The game goes on until all have been imprisoned, the side which has secured the most players winning the game.

Moon and Morning Stars. This is a game to be played in the sunshine. The player who takes the part of the moon stands in the shadow of the schoolhouse, tree or other object, and is not permitted to go into the sunshine. The other players, the morning stars, dance into the shadow near the moon and call:

O the Moon and the Morning Stars!
O the Moon and the Morning Stars!
Who will step—Oh,
Within the shadow?

The moon then attempts to tag the stars. Anyone caught may be kept with her or change places with her.

Frog in the Middle. This game may be played by any number. One is chosen to be the frog and must sit with crossed feet in the center. The other players, who stand in a circle about him, keep repeating, "Frog in the middle can't catch me!" They dance back and forth in front of the frog, seeing how near they can go without being tagged. The frog tries to tag them, but must not change his position. Anyone tagged must be frog.

Other Games. Any crowd of children is certain to have its favorite games, in addition to those listed above. One or more can always be found who will be only too eager to lead the rest in Pussy Wants a Corner; Farmer in the Dell; King William Was King George's Son; Here We Go Round the Mulberry Bush; Oats, Peas, Beans and Barley, O; I Spy; and any of the various kinds of tag. It is difficult for an older person to understand the charm which such a game as The Farmer in the Dell, for instance, holds for children. True, there is little action, but the children find very attractive the circling about in time to the meaningless chant while the chance of being "taken" next keeps each little player keyed up and interested. The one directing the play should see that all are given turns.

Games for Older Children

As children get older a change is noticeable in the play element which most appeals to them. They no longer are satisfied merely to keep on the move, while the little verses which accompany so many of the young children's games seem to them foolish. Instead, they have the competitive instinct strongly developed—they are intensely anxious for their own side to win. Races, therefore, of one sort or another, are likely to appeal to them particularly.

In the Schoolroom

Overhead Race. Any objects which are not too heavy, as bean bags or books, are held aloft by the pupils in the front seats. All the other children sit erect also, with arms raised high above their heads, and at the given signal the bags are passed back from hand to hand until they reach the last pupil, when the process is reversed and the bags are passed forward. When a first seat pupil receives his bag again he rises to show that his row has won. This game never fails to rouse great enthusiasm, and the breathless haste which it calls for stirs up sluggish blood.

Another Bean-Bag Game. This is an excellent game but unless a number of boards are provided only a part of the children can take part in it each day. In a piece of thin board or heavy pasteboard are cut five holes, each six inches square, and these are numbered 10, 20, 30, 40, 50. This is placed in a slanting position, with one end raised about nine inches from the floor, and the players take their stand about ten feet from it and try to toss bean bags through the hole. Each successful throw credits the player with points according to the number of the hole through which the bag has passed, while every bag which falls on the floor takes ten from his count. Thus if a player throws six bags, sending one through the 10 hole, two through the 20, one through the 40, and two on the floor his score will be $10+40+40-20$, or 70.

First In, First Out. Groups of three erasers or bean bags are placed in squares, marked on the floor with chalk in front of alternate rows. Beginning with the pupils in the front seats of these alternate rows, the players take one object at a time from each of the squares, placing them in similar squares at the back. They must run down one aisle and return by the other. As soon as all the objects are gathered they are brought back in the same way, and the pupils in the second seats continue the game without any interruption. Then the pupils in the third seats repeat the process, and so on down the row. The row which finishes first makes known the fact by clapping. Such a game is exciting and very enjoyable, and is excellent for giving an outlet for the repressed energies of children between the ages of ten and fourteen.

A similar game may be played in which the players run to touch front and back wall in succession and then take their seats. Such a game is excellent when time is limited.

Out-of-Doors

Tug of War. A chalk line is drawn and the players divide into two parties, one on each side of the line. Each group then grasps one end of a long strong rope and at the word of command the two sides begin to pull against each other. The side which pulls its adversaries over the dividing line wins the game.

Catch the Salmon. Two boys are chosen as "fishermen" and each grasps an end of a piece of strong rope. All the other players, the "salmon," take their place in the "sea"—which is the space marked off by a chalk line. The salmon-catchers may not cross this line, but may advance to it and try to throw their rope over a "fish," for the fish are daring and come very close to the line. Once caught a salmon may twist or jump or stoop, but he may not free himself with his hands, and when he is dragged across the line he must cease to struggle—he has been "landed."

Run, Sheep, Run. The players divide into two sides, each with a leader, and a goal is decided upon. One party remains at the goal, while the other goes off and hides, agreeing with its leader as to certain signal words. The leader then returns and stays near the other flock as it hunts for the hiders, calling out his signals from time to time to warn his flock. When he feels that the seekers are getting so close that discovery is certain, or when they have gone so far

from the goal that his flock may reach it first he calls "Run, sheep, run," and the hiders dash toward the goal. If they arrive ahead they have another chance to hide.

Other Games. Almost innumerable are the games which are adapted to these older children; many of them are so well known that it is necessary merely to mention their names. Last Couple Out and Three Deep are general favorites and many a picnic crowd beyond children's age finds in them much enjoyment. Fire on the Mountain, Prisoner's Base, Fox and Geese, Leap Frog and Crack the Whip are others which almost every child will recognize by name. In some of these, especially in the last-named, care should be taken lest they become too rough. Every group of children will suggest other favorite games.

Quiet Games

"What shall we do?" What mother has not heard that repeated, especially on stormy days, until she has dreaded the sound of the words. Here are a number of games which may be played indoors without any great amount of noise and all are so simple that children can play them.

Hot or Cold. One child leaves the room and some object is hidden by the others. When he returns and starts his search the others aid him by humming or singing, softly to show that he is "cold," or far from the hiding-place, and more loudly to show that he is getting "hot," or closer to the object.

Rhyme Words One player thinks of a word and tells the others, not the word itself but one that rhymes with it, while they try to find out the word by asking questions. For instance, "I'm thinking of a word," says the leader, "which rhymes with *can*." "Is it a color?" says one. "No, not *tan*." "Does it help to keep us cool?" "No, not *fan*." "Does it walk on two legs?" "No, not *man*." "Do we see it in the kitchen?" "Yes, it is *pan*." The one who has guessed correctly then chooses a word, and so the game goes on. This game may be varied by having the leader and guessers spell the words. Thus—"I am thinking of a word that rhymes with *f-a-n, fan*." "Is it *c-a-n, can?*" "No, it is not *c-a-n, can*." "Is it *p-a-n, pan?*" "Yes, it is *p-a-n, pan*." For the older children the game becomes interesting as a test of vocabulary and good spelling, and gives pleasure as a mental stimulus.

Ten Questions. An object is chosen in the absence of one player and he must then guess what it is by asking questions, limited in number to ten. Each of these must be in such form that the answer may be "yes" or "no," except the first, which is usually "Is it animal, vegetable or mineral?"

Buzz. Very little children cannot play at this, but all those who have mastered the multiplication table up to "seven times" will find it very interesting. Sitting in a circle the players count in turn, "One," "Two," "Three," and so on, but whenever seven or any multiple of seven or any number in which seven occurs is reached, *Buzz* must be substituted. Thus, 7, 14, 17, 21, 27, 28, and so on will not be named, the word *Buzz* taking their place. Any player who gives the number instead of *Buzz* must drop out.

Beast, Bird or Fish. One child stands in front of the rest and says rapidly, "Beast, bird or fish!—Fish, John," and John, or anyone else called upon, must then name a fish before the leader has counted ten. The three different classes of animals should not always be called for in regular succession as this makes the game too simple.

Kitty Miaou. The "cat" is stationed outside the door of the room within which the other players are assembled. In response to the cat's "miaou" one child after another repeats "miaou" while the cat tries to recognize each by his voice. The first one so recognized becomes the cat in turn.

Public Games

Wonderful as seems the great popularity of all modern competitive games, whether interscholastic or professional, these do not yet play so large a part in the life of the people as did the great games of the ancient peoples. Most of these were looked upon as religious festivals, and in no way could greater honor be shown the dead than by the celebration of elaborate games. In the *Iliad* Homer tells how the two armies made a truce, that Hector, the great Trojan hero, might be buried with fitting rites and games. These ancient games were chiefly exhibitions of strength or endurance and included running, wrestling, boxing, discus-throwing and chariot-racing. No valuable prizes were given, but the simple laurel wreath which crowned the victor was looked upon by the Greeks as the highest honor a man could win. Best known of these famous game-festivals, which played a large part in Greek life by promoting national unity and by developing that type of "sound mind in sound body" which Greek art and literature depict, were the so-called Olympian Games (which see). In Rome the games were often of a lower and more brutal order, consisting of gladiatorial combats or of conflicts of men with wild beasts in the arena, but so thoroughly did they satisfy that "bread and the games" were the two things demanded from the emperors.

In modern times baseball is the great professional game in America, while other athletic games are largely the province of schools and colleges. Very pretentious are some of the great football struggles between large schools, and many thousands of people watch them with breathless interest. Some years ago the Olympian Games were revived as an international affair, and were of world-wide interest until interrupted by the War of the Nations.

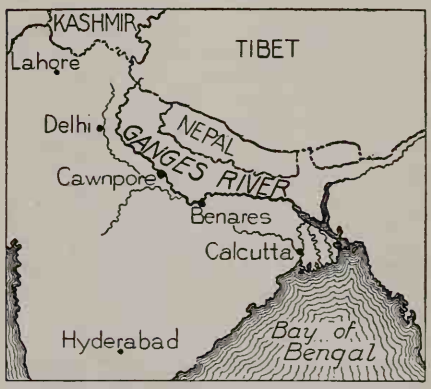
The great value of games is not that thousands shall sit cramped in uncomfortable bleachers in broiling sunshine to see a group of over-trained lads, who are often weakened by this over-strain, struggle in a game of football; but that all our youth shall receive, while still attending school, such training as will make for a completely rounded physical development. That this can be done, and joy and power be added, should be a cause of rejoicing, and the efforts of parent and teacher should be united to make our boys and girls stronger, more alert, better able to withstand all enemies of health—through consistent, normal, regular training in calisthenics, swimming, and out-of-door games that develop the muscles, train the eye and keep the heart clean and pure.

Every important competitive game, whether it be athletic, as baseball, football, golf or tennis; or mental, as chess, checkers or whist, is given full treatment in these volumes. F.H.

GANANOQUE, *gah nah nohk′*, a summer resort in Leeds County, Ontario, situated on the north bank of the Saint Lawrence River, at the point where it receives the waters of the Gananoque River. Brockville is thirty-four miles northeast. Railway transportation is provided by the Thousand Island Railway, which connects with the Grand Trunk Railway at Gananoque Junction, three miles distant. Steamers communicate directly with Toronto, Montreal, and Rochester and other Canadian and United States ports.

Gananoque is an Indian name, meaning *rocks on the water.* It refers no doubt to the Thousand Islands (which see) in the lower Saint Lawrence River, here nine miles wide. The town has a post office and customhouse, erected in 1914, a high school and a public library. The Gananoque River at this point has a fall of twenty-one feet, affording abundant water power. There are about twenty industrial establishments, engaged chiefly in making cheese and small foundry and machine shop products; there are also boat-building yards and granite quarries. Gananoque was incorporated as a town in 1890, and in 1911 had a population of 3,804. F.J.O'C.

GANGES, one of the world's great rivers, is to the Hindus the most sacred river of India, a stream whose waters, according to popular belief, work curative miracles and cleanse the body as no other water can do it. Holy cities



COURSE OF THE GANGES

line its banks, temples are approached by stairs or *ghats* direct from the water's edge, and it is a popular superstition that whosoever meets death in the river is borne on its waters to Paradise. At Benares, Allahabad and other cities many thousands of pilgrims meet every year for the purpose of bathing in the Ganges and taking home a little of the holy water. To the natives of Hindustan the Ganges represents the great center of religious life. To the modern Western mind the river appeals as the commercial route down which most of the great wealth of India floats to the sea.

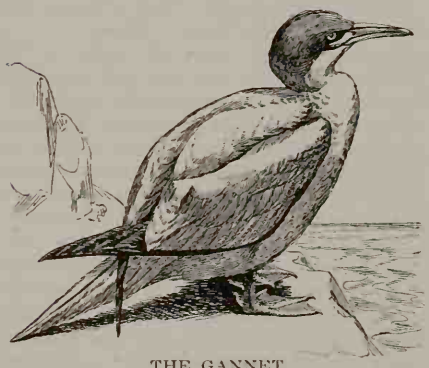
The river, which drains the slopes of the Himalaya Mountains, rises in a vast snow field 10,300 feet above sea level, and after a course of 1,557 miles it pours at the rate of about 400,000 cubic feet per second into the Bay of Bengal. Its basin covers an area of over 390,000 square miles of the most fertile and most densely-populated country in the world. The Jumna, Ramganga, Gumti, Gogra, Son and Kusi rivers swell its waters, which in rainy seasons overflow its banks for hundreds of miles. The mouths of the Ganges form the largest delta in the world. This great delta makes a network of dismal jungle and swamp land inhabited by crocodiles and other wild animals. Calcutta, Patna, Murshidabad, Cawnpore and Bahar are among the most important cities on its banks.

Ganges Canals, two irrigation canals running parallel with the Ganges for a distance of 100 miles, storing water for irrigation purposes. Together they water nearly 2,000,000 acres of land, on which rice, indigo, cotton, fruits and opium are grown in vast quantities. F.ST.A.

GANGLION, *gang'gli on.* See NERVOUS SYSTEM.

GANGRENE, *gang'green,* is mortification, or local death, of body tissues. There are two forms of the disease—dry and moist. The former is particularly a disease of old age, due to arterial changes, and its progress is extremely slow. Its symptoms are numbness, some pain and a drying and blackening of the skin. Moist gangrene results from infection, suspended circulation and other agencies which destroy the tissues. This form shows a soft discolored mass, covered with blisters, and is characterized by a disagreeable odor. In both forms of the disease there may be a zone of inflammation between the dead and living tissue called the "line of demarcation." Hospital gangrene was at one time frequently found in hospitals which were improperly conducted, from a sanitary standpoint. In these cases mortification quickly followed infection and demanded prompt surgical operation. Modern aseptic methods have abolished this form of the disease. The treatment of gangrene is usually a matter of incision or amputation well beyond the affected area, but in its early stages the disease may be checked by careful dietary and medicinal treatment.

GAN'NET, a large, white sea bird which is often of service to fishermen, because it discloses the location of schools of herring by following them and diving for the fish, which is its main food. The birds have strong, sharp bills, webbed feet, a small pouch beneath the throat, and are about three feet long. They make their nests of seaweed on rocky cliffs on Bird Rock and Bonaventure, in the Gulf of Saint Lawrence, and on islets off the British Islands. They are very tame, and the mother will not move off her one pale, bluish-white egg even when a person walks close to her. The young require nearly two months to complete their growth and remain mottled brown for three or four years.



THE GANNET

GANYMEDE, *gan'i meed,* in mythology, was a youth of marvelous beauty, whom Jupiter (which see), in the form of an eagle, kidnapped and carried off to Olympus to be his cupbearer. Hebe, the goddess of youth, had always poured the nectar in which the gods often pledged themselves, until one day at a solemn occasion she tripped and fell. This accident disgraced her and she was forced to resign her office. So Jupiter, in the form of an eagle, left Olympus in search of her successor, and flew over the earth until he saw this beautiful youth, the son of the king of Troy. Swooping down, he caught the boy in his mighty talons and carried him back to the top of his mountain, where he was taught his duties as cupbearer to the gods. A marble statue, which is a copy of an early bronze statue by Leochares of Athens, representing Ganymede being carried off by the eagle, stands in the Vatican at Rome. Homer says:

> "And godlike Ganymede, most beautiful
> Of men, the gods beheld and caught him up
> To heaven, so beautiful was he, to pour
> The wine to Jove, and ever dwell with them."

GAPES, *gayps.* Poultry often have a disease which makes them open their beaks and cough continually. This disease is called *gapes,* and is caused by a tiny worm which lodges in the windpipe of the fowl. Gapes is not a fatal disease, but it prevents poultry from fattening. The best way to cure the malady is to make the fowls breathe the dust of air-slacked lime, which starts a violent coughing and dislodges the worm. Epsom salts added to the food may effect a cure. Another favorite method of dislodging the worm is with a feather dipped in turpentine. The coops, dishes and even the earth in the coops should be disinfected after the disease has been banished.

GAR. There are two kinds of fish that are called *gar,* or *garfish,* because they are much alike in structure and appearance. Both are long and slender, with round bodies and spearlike snouts which are filled with teeth. One

lives in the warm parts of the ocean, grows about two feet long and feeds on smaller fishes. It is often taken to the city markets, as it has a good flavor, something like that of mackerel. The other gar lives in the rivers and lakes of North America, grows to be about five feet long, but is not good to eat. Like the ocean garfish, it eats smaller fish and interferes with fishing by destroying nets, so it is killed freely. Many different species belong to this family.

GARAGE, *ga razh'*. The word is French, and it has been taken over without change of form or pronunciation into the English language; it means *keeping under cover,* or *to keep under cover,* and has become limited in its application to automobile storage rooms. Since automobiles have so largely taken the place of horses and carriages, the *garage* has taken the place of the old livery-stable and barn. It is a building where men clean, repair and store automobiles.

GARBAGE, *gar'baj,* is household refuse, chiefly of animal and vegetable matter. The problem of preventing refuse from becoming a menace to public health has always been important, and in many instances, difficult of solution. Garbage carelessly thrown out and allowed to lie on the ground soon becomes a prolific source of disease. Most cities have until recent years expended large sums in contracting for its disposal, but modern scientific study proves that instead of being an expense, garbage can be made an important source of municipal revenue. As the refuse comes from hotels, restaurants, private houses and other buildings it consists of a mixture of meats, fish, vegetables, bread, bones, bottles, paper, tins and the like. That such a collection should prove to be worth considerable money appears strange, yet it is true.

Cost of Removal. No matter how garbage is finally disposed of, whether dumped into a river or lake, used to fill in waste ground, burned, or turned to profit by scientific treatment, the most expensive item connected with its removal has always been hauling. From the nature of the garbage it is advisable that the removal be done at night, unless the most modern covered metal wagons are available. This adds to the expense, as night work is always more costly than day work. Each house and building is supplied with garbage cans of suitable size, into which refuse is thrown. These cans are collected and emptied into wagons, which are then hauled to the point of disposal. Contracts between municipalities and removers were formerly based on the principle of paying a certain sum yearly for the removal of the garbage. In many cities firms now contract and pay for the right to collect, remove and utilize the garbage, thus actually reversing conditions. In large cities the amount of garbage collected averages about 500 pounds per head of population per year. In a city like Chicago, with a population of 2,500,000, the contractor or the employees of the city itself must remove and dispose of 1,250,000,000 pounds, or 625,000 tons, of garbage annually. That means that whoever undertakes the work must be prepared to haul over 1,711 tons of garbage daily.

Value of Garbage. It has been found that not only can garbage be made to pay for its own removal but that it can and does produce handsome profits for those securing contracts for its disposal. Until recently, a contractor was paid $50,000 annually by the city of New York for the removal of garbage. That same contractor later offered to pay $130,000 for the right to remove and dispose of the garbage for a period of five years.

European cities, especially those in France and Germany, have been in advance of American communities in devising methods of effective utilization of garbage. In a typical up-to-date European plant the *pure garbage,* that is, the organic matter which remains after tin cans and similar objects have been removed, is boiled for eight hours or more, then subjected to high pressure to eject moisture, after which it is dried, screened and ground. Of the resulting substance, called *tankage,* from three to four per cent is ammonia, five to ten per cent bone phosphate, and one-half to one-and-a-half per cent potash. These elements make the tankage a fertilizer; though not a very valuable one, it has the advantage of containing only a small amount of fat, which is a drawback in such fertilizers as cotton seed. The grease which is removed from the tankage by pressure is valuable for soaps, glycerine, nitroglycerine, dynamite and other fat-products. In some American plants the grease is extracted by treating the garbage with hot naphtha.

The garbage which is not fit for tankage contains many substances, such as rubber, paper and metal, which may be sold to dealers in them. The residue may be burned as fuel in electric light or steam plants. In America it is a common practice to burn the entire

quantity of a city's garbage, but this is very wasteful, as at best only the bone phosphate and potash can be saved. C.H.H.

Consult Morse's *The Collection and Disposal of Municipal Waste:* Parsons' *The Disposal of Municipal Refuse.*

GARCIA, *gahr the'ah,* the name of a family of celebrated Spanish musicians and singers, of whom MANUEL DEL POPOLO VICENTE GARCIA (1775-1832) was the father; MANUEL GARCIA (1805-1906), the son; and MARIA FELICITA GARCIA (1808-1836), better known under her subsequent name of MALIBRAN, was the daughter.

The father was an eminent Spanish vocalist, music teacher and composer, born at Seville. In 1808 he went to Paris and met with great success in Italian opera. Later he studied the Italian method in Italy, where he duplicated his former triumphs, and then went to London. In 1826 he toured the United States and Canada, with a company of excellent talent, among them his son and daughter; this event marked the introduction of Italian opera to American audiences. He and his company gave seventy-nine representations, including two of his own operas. He extended his operatic tour as far as Mexico, where he was robbed of his wealth by bandits.

To few men is given the privilege of celebrating their hundredth year of life, but this was granted to Manuel Garcia, on March 17, 1905, in London, in the presence of over four hundred guests distinguished in the scientific and musical world. On that occasion he received decorations from King Edward VII of England, Emperor William of Germany and King Alfonso of Spain. At the age of twenty he was well known as a singer, composer and orchestra conductor. After a successful operatic tour in America as a member of the company with his distinguished father and sister, he returned to Paris and became famous as a teacher of singing. Jenny Lind was one of his pupils. He is famed in the scientific world also as the inventor of the laryngoscope, the idea for which was gained by the accidental placing of two small mirrors by which he was enabled to note the position of the vocal chords during singing.

The daughter, Maria Felicita Malibran, was born in Paris. She possessed a soprano voice of great sweetness and phenomenal compass. When but seventeen years old, she played the leading rôle in *The Barber of Seville,* at Covent Garden, London. Her gifts as an actress were on a par with her beautiful voice, and she made her greatest triumphs in tragedy. She was unhappily wedded to a New York banker, named Malibran, whom she divorced. Later she married a Belgian violinist, Charles de Beriot. R.D.M.

GARCIA Y INIGUEZ, *gahr se'a e e ne'ges,* CALIXTO (1836-1898), a Cuban soldier-patriot who gave thirty years of his life to the cause of the freedom of his native land, and who died on a mission in its behalf. He was born at Holguin, Santiago Province. For a while he practiced law, but in 1868 became a leader in the Cuban insurrection known in history as the Ten Years' War. When General Máximo Gómez was removed from command by the government, Garcia succeeded him as commander-in-chief of the Cuban forces. At one time, with a band of only twenty men, Garcia was surrounded by 500 Spaniards. Rather than be captured, he attempted suicide by shooting himself through the head. He recovered, however, and was taken to Spain, where he was held a prisoner for fifteen years. He escaped in 1895, the year of Cuba's final insurrection, and went to the United States, where he engaged in filibustering. Eventually he succeeded in reaching Cuba and joining the native forces and soon won important victories as one of the chiefs of the Cuban forces. He died in Washington during a conference at which Cuban affairs were being discussed.

When the United States decided to go to the rescue of Cuba, and war broke out between that country and Spain, one of the first things to be done was to communicate with the insurgent leader, Garcia. No one knew just where he was, and the task was a dangerous one. The way a man named Rowan, without a question which would disclose his identity or arouse suspicion, faithfully delivered that communication to Garcia in the wilds of Cuba, inspired Elbert Hubbard's *A Message to Garcia.* It is a pamphlet which carries an inspiring message.

GARDEN, MARY (1877-), a grand opera star, who was as great an actor as a singer, was born in Edinburgh, Scotland. She moved with her parents to Chicago at the age of eleven, where she remained until nineteen, when through the aid of friends she was enabled to continue her musical education. Miss Garden is regarded as practically self-taught, as she had very little instruction at home, but made much of two years of study abroad; she learned her art upon the stage, for the most part, and her opportunity came quite unex-

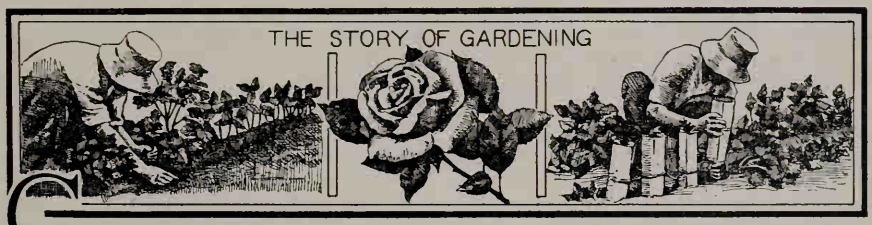
pectedly. Charpentier's new opera, *Louise*, greatly appealed to her, and she learned the title rôle at a time when there was not the slightest prospect of ever appearing in it. One night in 1900 the singer who had the rôle of Louise became suddenly indisposed. It was Mary Garden, unknown and unrehearsed, who was called to make her professional debut in the third act and to carry off the triumphs of the evening. Her interpretation brought instant fame, and within a week the youthful choir singer from Chicago became one of the stars of the Opera Comique and the favorite of Paris. In addition to the rôle of Louise, which she has presented over two hundred times, she has appeared in many other notable operas, but won her greatest successes in *Pelleas and Melisande, La Traviata, Helene, Manon, Thais* and *Cherubin*.

MARY GARDEN

GARDENIA, *gahr de' ni a,* a shrub of the madder family which is cultivated in a double-flowered variety in hothouses everywhere. Its waxy-white, sometimes yellow, fragrant blossoms are attractive in florists' windows. This variety is also found as a hardy outdoor plant in the Southern United States. In the gardens of Charleston, S. C., they are objects of special pride. for the genus was named by the botanist Linnaeus, after Dr. Alexander Garden, a citizen of Charleston.

GARDENIA
Flower and leaves.

Cape Jasmine is another name popularly given these tropical and subtropical shrubs, although they are not related to true jasmines. One species, however, is abundant at the Cape of Good Hope and they somewhat resemble jasmines, hence the name. In South Africa the very hard wood of the shrub is used for agricultural implements and other useful articles. The best known species was brought to America from China, where the orange-colored fruit or berry is used as a dye. The leaves are dark green, smooth and lance-shaped. They cluster closely about the camellialike blossom with its smooth, thick petals, which are so delicate they will turn brown at the slightest bruise. See JASMINE.



GARDENING, the art of working hand in hand with Nature, which gives us cultivated flowers and plants to delight the eye, and fruits and vegetables to nourish the body.

Gardening is the oldest of all the arts. Tennyson calls Father Adam "the grand old gardener," and Shakespeare says, "There is no ancient gentlemen but gardeners." Two thousand years before Christ the Egyptians had irrigated gardens; the Babylonians knew the Hanging Gardens of Nebuchadnezzar, one of the Seven Wonders of the World; and in all countries and ages since, people have made gardens for their use and pleasure (see HANGING GARDENS OF BABYLON).

Never before, however, has so much attention been given to this delightful and profitable occupation as in the twentieth century. Perhaps some of this interest can be traced to the *school gardens* which have recently become such an important part of the study course, both in rural and in city districts. Again, the city man's backyard gardening is an attempt to reduce the constantly-increasing cost of living as well as his way of getting "back to the land." So important does the promotion of

home and school gardening seem to the United States government that the Bureau of Education has established a School and Home Garden Division, with experienced teachers in charge, who devote their entire time to investigating and directing garden work in the big cities.

Specialized Gardening. A farmer is only a gardener on a large scale. A gardener who specializes in vegetables is usually called a *truck,* or *market, gardener;* a specialist in fruit, a *fruit-grower,* or *orchardist;* a specialist in flowers, a *horticulturist.* A *landscape gardener* is an artist engaged by large estates or public park commissioners, who, instead of paints and oils, works with flowers, shrubs, trees, lawns, drives and fountains to paint nature pictures that change with every season and almost with each hour of the day.

What a Garden Teaches. A garden is like a very wonderful school where all the instructors teach by silent but interesting object lessons, and where all the pupils "learn to do by doing." It teaches more practical botany than a nature-study course; but it is not merely botany: it joins hands with the study of birds, bees and butterflies, insects and plant bacteria, with the lore of the weather and the seasons, the chemistry of the soil, the use of tools.

A garden is of physical benefit through the healthful outdoor exercise its cultivation affords; and such exercise has an added value because it is really *creative.* Moral education it gives, too, in lessons of tenderness for helpless things; lessons in responsibility, patience and perseverance, and that vital lesson all must learn—that any success worth having results from work. A garden teaches regard for the rights of others, because a child who has cared for a plant from its seedtime understands what ownership means.

A garden is an education in the appreciation of beauty, color, artistic arrangement and fragrance. It provides a "first course" in the love of Nature. Being such a little corner of the great outdoors, it permits a closer intimacy with Mother Nature than great woods and rolling stretches of countryside can ever give. Looked at from the purely commercial point of view, a garden is an education in economics. A boy or girl who keeps the home table supplied with fresh fruits and vegetables learns how work changes itself into pennies, which grow into dollars. A garden helps to form the good habit of thrift when its surplus is sold and the boy or girl encouraged to put this money in the bank or to spend it wisely. In many families parents find it a good plan to pay the little gardeners for all produce used for the table, realizing how great an incentive this supplies to steady and enthusiastic work.

The Site and the Plan. Whenever there is any choice in the matter of selecting the location of the garden, the important points to be considered are *soil* and *exposure.* A southern slope with shelter on the north gives ideal results. At any rate, the garden should be in a free, open space, away from shade and big trees, so that Nature's handmaids—sun and air—may work their magic without interference.

The second thing to decide is what kind of a garden it is to be—whether a vegetable garden, a flower garden, or a combination of the two.

Next comes the making of a "working plan," on paper. This should be a diagram, drawn to scale—say, a quarter of an inch for each foot of space—and should show the exact widths and arrangement of beds, paths and borders. Whenever possible the beds should be so arranged that the rows will run north and south, to give the plants the full benefit of the sun from morning till evening. So much depends upon space and purpose that it would be useless to try to present a suggestive plan in this brief treatment. Home-making magazines and special gardening periodicals should be consulted, as well as the many attractive and inexpensive books on the subject, for there is no art that has a larger or more fascinating literature.

As to the size of the garden, the beginner must beware of "o'erleaping ambition." Planning and seed-planting are easier than cultivating. A neglected garden may be worse than useless, while even a small plot well tended will yield good profit and endless satisfaction. It is wise to begin on a small scale, find out by experience how much can be well done and then extend operations from season to season. A small bed for a young child, a plot twenty-five feet square, more or less, for an older boy or girl, will afford excellent training and practice, and from these modest beginnings the garden may be increased year after year. The novice should confine himself to the common and easily-grown varieties, whether among vegetables or flowers. In the flower garden, annuals and vines that grow quickly are encouraging for the beginner. The hardy perennials, which bloom year after year,

are also a wise choice, especially for anyone whose gardening time is limited.

Getting the Soil Ready. If seeds are to be properly nourished when planted they must be dropped into ground that is well supplied with plant food. One of the most important of these foods is nitrogen, usually given to the soil by spreading over it a coating of stable manure three or four inches deep. Again, if the tiny rootlets are to send their fibers down through the ground for food and moisture, and if the young plant is to push its way upward into the sunlight, the soil must be soft and fine. To make it so, the garden plot must be thoroughly spaded and dug to the depth of a foot. It must then be turned over again and again with hoe and rake, until all lumps are broken up. Spading and raking are to small gardens what plowing and harrowing are to large farms. Next, since the soil needs potash and phosphoric acid, as well as nitrogen, to feed to its plants, wood-ash and bonemeal should be sprinkled upon its surface, or one of the good chemical fertilizers sold in the stores should be obtained. By working this in thoroughly the soil will become pulverized and mellow.

Planting the Seed. All planting must be done on a freshly-prepared surface; that is, the ground must be watered, hoed and raked smooth just before the seeds are put into the ground, no matter how much previous work has been done.

Only good seed will produce healthy plants; therefore it should be bought at a reliable seed-house and then tested before planting. A simple testing method is explained in the article on SEEDS. The very tiny seeds are usually scattered on the soft ground and pressed in firmly with a smooth board; larger ones are planted at varying depths. During the summer seeds need to be planted deeper than in springtime, because it is necessary to go farther down to find moist soil. The *planting table* in the article VEGETABLES gives definite instructions for planting vegetable seeds; a similar one for flowers will be found under that article, subhead *Suggestions for a Flower Garden.*

After the planting, the soil must be pressed or stamped down firmly, bringing the earth in contact with the seed, and making it compact enough to hold the moisture needed for germination. Each row or bed should then be tagged with a thin wooden marker on which are written the kind of seed and the date of planting.

When to Plant. Planting time varies in different localities and in different years. Experienced gardeners go according to the fruit-tree calendar. When the peach and pear are in bloom they plant the hardy vegetables, such as onions, lettuce, radishes, spinach, beets, parsnips, turnips and the like. When the apple blossoms appear they plant the more tender varieties, like beans, corn, melons, pumpkins and cucumbers. Most of the flowers, with the exception of the sturdy little pansy and a few others, also need to be held back until this more conservative time. However, if the gardener wishes to get an early start he plants his seed in a hotbed or cold-frame, which is easy and inexpensive to make, or starts it in pots or "flats," kept indoors. Then he waits with his transplanting until the warm weather has come to stay, which is generally when apple-blossom time is past.

What Cultivation Means. Cultivating the ground means keeping it well fed, well stirred and well watered. Occasionally, particularly if the garden does not seem to be thriving, a fertilizer should be sprinkled upon its surface. Different soils need different treatment, but one of the best all-round fertilizers is bonemeal. When manure is used care must be taken not to let it come in contact with the plant itself. Lime helps to keep the soil sweet. Mulch, a light layer of fine soil kept on the garden surface, assists the ground in retaining its moisture and keeps out weeds; it is secured by hoeing the ground and then dragging a rake lightly over it. Frequent sprinkling with a hose is necessary.

Protecting the Garden. Every garden is a battlefield, with the flowers, vegetables, birds and gardener in league against destructive insects and troublesome weeds. The fight against the weeds must begin the minute they send their unwelcome stalks through the earth, for they are using up food that belongs to the rightful possessors of the soil. The younger they are, the easier to uproot, and if the war is well fought in the beginning of the season, the later struggle will be less strenuous. Constant stirring and mulching of the soil discourages the weeds, and the garden more than repays the time and effort bestowed upon it by looking trim and yielding abundantly. The United States government has given special attention to the weed problem of farmers and gardeners in its bulletin entitled *Weeds and How to Kill Them;* this pamphlet may be obtained through the Department of Agriculture.

A VILLAGE BACKYARD AS IT FREQUENTLY APPEARS

Among the insect foes of the garden are those that actually devour the plant and those that injure it by sucking its juices. The weapon used against the eating insects is poison, such as Paris-green or Bordeaux mixture, which is sprayed on the leaves. The sucking insects have to be deluged with liquid or powder; lime, soot, tobacco dust and kerosene emulsion are among the usual remedies. The cutworm, which comes early and does fearful damage all summer, is best conquered by feeding it poisoned bran mash; the rose-borer is fought with hellebore. The different vegetables have special enemies, each of which is susceptible to certain poisons and not to others.

In a small garden the insect population can generally be kept down by going over the patch systematically every day, particularly early in the season, picking off the bugs and dropping them into a can of kerosene. A weedless garden has few insect invaders. And, of course, the birds and toads are constantly coöperating with the garden's owner, so that by encouraging the presence of these allies he will find his labors greatly lightened. A birdhouse and a drinking basin will attract the winged helpers (see illustration, in the article BIRD). A dark, cool corner fitted up with a few stones, or a box lying on its side under a bush, will furnish the toad a home in which he will live contentedly as assistant gardener.

Making the Garden Pay. There is profit in gardening, even for a boy or girl who has only after-school and vacation-time to give to it. Many an unattractive backyard or empty lot, such as the one shown in the accompanying illustration, which has been a mere dumping-ground for rubbish, has been transformed by the children of the family into a commercial success like that shown in the second picture. Such a transformation pays cash dividends on time and effort, besides making the home surroundings pleasanter and more healthful.

It is an easy matter to find customers for the surplus garden produce, for there is always a demand for home-grown vegetables and berries. A boy who goes into gardening as a business should concentrate on one or two vegetables; first, in order to have a sufficient output for the market, and, second, because it means less effort and greater returns. When he has mastered these he can add others to his list. Specializing has good profit in it, however, and many experienced gardeners prefer to devote their entire time to a single crop.

The young gardener may work up a route of private customers in his own neighborhood; he may sell to the town grocers or hotels; or he may dispose of his produce by shipping to outside points. The parcel post offers an ideal rapid delivery service for garden products. He should consult with an experienced shipper in order to learn how to prepare his vegetables most attractively and how to pack them in the best way. Good advice is contained in the United States government bulletin on *Marketing by Parcel Post*. Many a boy has in this manner made his vacation pay for the following year's work in college. There are indirect profits, too. Prize specimens of garden art often win worth-while cash rewards at state or county agricultural exhibits; and more than one amateur gardener, branching out into general farming, has found his early experience in the home garden a valuable asset.

Girls as well as boys can make money by selling flowers to florists or to people who lack flower gardens, or by raising young plants in hotbeds or flats for supplying neighbors who might not otherwise be tempted to make gardens. Pansy plants, especially when they have begun to bloom, are very quickly disposed of. Seeds and bulbs can be sold in a small way. Boys and girls may also do garden service, charging for their work by the hour and thus turning their knowledge into cash.

THE SAME BACKYARD TURNED TO PROFIT

Canning and preserving the surplus vegetables and fruits of the garden is a home industry in which women and girls are finding wide scope for profitable work. Some practical instructions along this line can be secured from the United States Department of Agriculture. The agricultural departments of the Dominion of Canada and of the several provinces also issue bulletins containing practical suggestions for various lines of gardening. L.M.B.

Consult Bailey's *Garden Making;* Duncan's *When Mother Lets Us Garden;* Higgins's *Little Gardens for Young and Old.*

Related Subjects. The following articles in these volumes contain much material which will be helpful in connection with the above. A number of these articles contain lists of related subjects, and to those also the reader is referred.

Agriculture	Grafting
Annuals	Horticulture
Bird	Insecticides and
Botany	Fungicides
Boys' and Girls' Clubs	Perennials
Breeding	Plant
Bulb	Pollen and Pollination
Canning Clubs	School Garden
Cross-Fertilization	Seeds
Fertilizer	Soil
Flowers	Vegetables
Fruits	Weeds

GARDEN OF THE GODS, the name given to a 500-acre region in Colorado, between Manitou and Colorado Springs, noted for its many curiously-shaped red and white sandstone formations. Among these are the *Cathedral Spires, Balanced Rock, Siamese Twins* and the *Seal and the Bear.* The gateway consists of two masses of red rock, 300 feet high, and only wide enough at the bottom to admit a vehicle. These grotesque masses are the remains of mountains worn and washed away by the winds and waters. A magnificent view of Pike's Peak is obtained from the Garden.

GAR'DINER, Samuel Rawson (1829-1902), an English historian, author of numerous historical works of recognized value. His *Students' History of England* and *An Introduction to the Study of English History* are widely used as textbooks in English and American schools. The most important of his works, marking him as an historian of very high order, are *The History of England from the Accession of James I to the Outbreak of the Great Civil War, The History of the Great Civil War,* and *The History of the Commonwealth and Protectorate.*

GARDI'NER, Stephen (about 1493-1555), a famous English churchman, who played in his day a rôle scarcely second in importance to those of Wolsey and Thomas Cromwell. As the secretary of Wolsey he was sent by the king to Rome in 1528 to persuade the Pope to allow Henry to divorce his wife. Though he was unsuccessful in this, and later refused to give up his Catholic faith, Henry continued to shower honors upon him. Under Edward VI he was imprisoned, but Mary restored him to his high place.

GARD'NER, Mass., a town in Worcester County in the north-central part of the state, of special importance as a center of chair manufacture. Fitchburg is fifteen miles east and Worcester is twenty-six miles southeast. Gardner is on the Fitchburg River and on the Fitchburg branch of the Boston & Maine Railroad. The population was 14,699 in 1910, and 17,140 in 1916, by Federal estimate.

Gardner includes South Gardner, West Gardner and Gardner Center, covering a total area of over twenty-one square miles. The town is pleasantly situated on seven hills and includes Dunn and Crystal Lake parks and some small streams. It contains the Levi Heywood Memorial Library and Museum, the Henry Heywood Memorial Hospital, a state colony for the insane, an almshouse and a home for the aged.

The industry of chair-making at Gardner dates from 1805. Levi Heywood (1800-1882)

was a local inventor of chair-making machinery and a manufacturer. Rattan goods, silverware, go-carts, machinery, pails, tubs, toys and oil stoves are other important manufactures. Gardner was named in honor of Colonel Thomas Gardner, a Massachusetts patriot who died from a wound received in the Battle of Bunker Hill. The settlement was incorporated as a town in 1785. It is governed by town meetings, following the practice begun in colonial days, convened when necessary. M.N.W.

GARFIELD, JAMES ABRAM (1831-1881), an American soldier and statesman, and the twentieth President of the United States. He was the fourth President to die in office and the second to meet a martyr's death. Garfield was a self-made man, in the very best sense of the word; without great genius, he won high rank in many fields through industry, perseverance and courage. As a teacher he kindled in his pupils a longing for truth which led them to regard him as one of the great teachers, to be compared with men like Arnold of Rugby. As a soldier he rose in two years to high rank, and would have risen higher but for a call to other duties. In Congress he became the leader of his party, yet he was not as great a party leader as some others of his time, because he frequently sacrificed party expediency to the national good. He was a far-seeing statesman who never lost sight of everyday morality.

As an orator, his own earnest faith made people listen to him with respect and he never stooped to oratorical tricks. His speeches seldom rose to lofty heights, yet he was always impressive. When he heard the news of Lincoln's death, he spoke a few simple words, from the balcony of the New York customhouse, which calmed a frenzied, horror-stricken mob: "Fellow citizens: Clouds and darkness are around Him; His pavilion is dark waters and thick clouds; justice and judgment are the establishment of His throne; mercy and truth shall go before His face! Fellow citizens! God reigns, and the government at Washington still lives." Only sixteen years later, he himself met death as Chief Executive at the hands of an assassin.

Youth and Young Manhood. James Abram Garfield was born in a log cabin at Orange, Cuyahoga County, Ohio, on November 19, 1831. His parents had moved from New York state to the Western Reserve only the year before. Abram Garfield, the father, made a good beginning on his new farm, but died before his son James's second birthday. Though James was the youngest of four children, his youth did not prevent him from doing his share of work. At the age of ten he was accustomed to hard manual labor, and he added his mite to the family income by working at every opportunity for the neighboring farmers. Meanwhile he had made great progress in his schooling. He read all the books he could buy or borrow, and he was especially fond of the Bible and of American history.

About his fourteenth year his imagination was kindled by a volume of tales of the sea; he wanted to be a sailor and to live a life of adventure. The quiet routine on the farm no longer satisfied him, and with his mother's permission he went to Cleveland, where he intended to ship as a common seaman on a lake schooner. He got no farther, however, than the deck of the first schooner he saw, when the captain spied him and urged him to get back to shore. Though somewhat disheartened by his experience, young Garfield determined not to return home without adventure and without money. Wandering about the city in search of work, he met a canal boatman, who hired him to drive his team along the towpath of the Ohio Canal. In later years Garfield never said much about this experience, but it is known that he was soon promoted from the towpath to a position on the boat. After several months an attack of ague sent him home and it seems to have banished any further desire to work on the canal.

It was then the boy's ambition to be a

teacher, and with this end in view he entered Geauga Seminary at Chester, ten miles from his home; then from 1851 to 1854 he studied at the Western Reserve Eclectic Institute, now called Hiram College. In the vacations he learned and practiced the trade of carpentry, helped on the farms at harvest time and taught school to earn money for his education. After his first term at Geauga Seminary he asked and needed no financial assistance from his mother.

During the three years Garfield spent at Hiram College he not only earned his way, but he saved $350 towards the expense of several years at an Eastern college. After hesitating as to Yale, Brown or Williams, he finally chose the last, chiefly because Mark Hopkins,

JAMES ABRAM GARFIELD

Of his brief and tragic career in the Presidency Woodrow Wilson, a later President, in his *History of the American People*, says: "Office seekers swarmed about the President with quite unwonted arrogance, and before he had been four months in his uneasy place of authority one of the crowding throng whom he had disappointed wreaked foul vengeance upon him."

its great president, wrote him a friendly letter of encouragement. There was some feeling among his friends and the members of his family that Garfield should have chosen Bethany College, in West Virginia, an institution controlled by the Disciples of Christ. Garfield was by nature religious, and he had recently been received into that denomination, of which his mother was also a member. The actual reasons he assigned for his decision against Bethany College revealed the independence of mind which was one of his most pronounced characteristics. In addition to the fact that the course of instruction at Bethany was limited, he said that Bethany was too friendly toward slavery, and, most significant of all, that as he had "inherited by birth and association a strong bias toward the religious views there inculcated, he ought especially to examine other faiths." Two years at Williams College completed his formal education, and in 1856 he returned to Hiram College to teach Latin and Greek.

Up to that time Garfield had given no indication of great ability. He was industrious, conscientious and courageous, but by no means conspicuous for his superiority. He had, however, laid a firm foundation, and within the next seven years was in turn professor, college president, state senator, major-general in the United States Army, and member of the National House of Representatives. This is a rise to fame paralleled in the lives of but few men.

In 1857, when only twenty-six, he was chosen president of Hiram College. As a teacher he was remarkably successful, because his own youthful enthusiasm, his thirst for knowledge and his regard for the truth communicated itself to his pupils. His classes discussed almost every subject of current interest in science, religion, ethics, art and scholarship, and felt his influence at every point. He occasionally preached, a practice permitted by his Church, and he was also studying law. At first he seems to have taken no interest in politics, but when the slavery question, which he thought a moral issue, became political, he sought every possible opportunity to oppose it. His prominence among anti-slavery men in Ohio led to his election, without solicitation on his part, to the state senate. There his industry and versatility were again apparent, and he investigated and made reports on such widely separate fields as geology, parliamentary law, education, finance and the state militia.

Garfield as a Soldier. In August, 1861, the governor of Ohio commissioned Garfield lieutenant-colonel of the Forty-Second Regiment of Ohio Volunteers. Most of the members of the regiment were graduates or students of Hiram College and were drawn into the army by Garfield's example. Very soon promoted to the rank of colonel, he reported with his regiment to General Buell, then in Louisville, Ky. Buell was so impressed by the efficiency of Garfield's regiment that he gave him the command of a brigade and ordered him to

drive the Confederates out of Eastern Kentucky. A fortnight later Garfield won the Battle of Middle Creek (January 10, 1862), on a field chosen by the enemy, who also had the advantage of superior numbers. This victory, followed by General Thomas's success at Mill Spring, nearly ended Confederate hopes in Kentucky. Garfield's services were acknowledged by the President in a general order to the army, and he was appointed brigadier-general. He reached Shiloh in time to take part in the second day's battle, was prominent in all the operations around Corinth, and showed considerable engineering skill in rebuilding bridges and the fortifications of Huntsville.

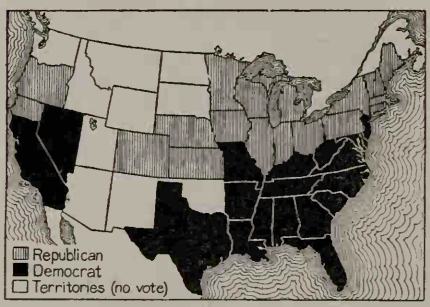
During the winter of 1862-1863 he was in Washington as a member of the court which court-martialed General Fitz-John Porter, but in February, 1863, he rejoined the Army of the Cumberland as chief of staff to General Rosecrans. During the Battle of Chickamauga, when a blunder caused the defeat of the Federal right, Garfield rode under fire to carry the news to Thomas, and under Thomas's orders helped to save the left from rout. For his services in this battle Garfield was commissioned major-general. Shortly afterward Thomas took command of the Army of the Cumberland and asked Garfield to take command of a division. Garfield was only thirty-two, with every prospect of a brilliant military career, but at the earnest request of President Lincoln and Secretary of War Stanton he resigned from the army and took his place in a new field.

Garfield in Congress. In 1862, while still in active service in the army, Garfield was elected to Congress; he took his seat in December, 1863. Lincoln urged him to take this step, with the plea that he could be of greater service to the Union while in Congress than in the army. Garfield's reputation as a soldier secured for him a place on the Committee on Military Affairs, an unusual honor for a new member, for the committee was at that time the most important in Congress. His authority on military matters won quick recognition, and his opinion was frequently sought as that of an expert.

At the close of the war he was transferred, at his own request, to the Committee on Ways and Means. His reason for choosing this new field was that, the war being ended, financial matters would demand first attention, and he wanted his share in their treatment. His capacity for hard work later won him a place as chairman of the Committee on Banking and Currency and of the Committee on Appropriations. Throughout the Reconstruction period Garfield was allied with the radical Republicans. He opposed Johnson's policies and voted for his impeachment. He was from the first an advocate of sound money, and never lost a chance to tell Congress and the country the necessity of saving the country's financial honor.

In 1876 he went to New Orleans, at President Grant's request, to watch the counting of the Louisiana vote, and in the next year, although he had been opposed to an electoral commission in the Hayes-Tilden controversy, was himself chosen a member by acclamation (see ELECTORAL COMMISSION). After Blaine's transfer from the House to the Senate in 1877, Garfield became the undisputed leader of the Republicans in the House. In January, 1880, the Ohio legislature elected him to the United States Senate, but he never took his seat.

The Election of 1880. In the national Republican convention at Chicago, in June, 1880, James A. Garfield sat at the head of the Ohio delegation. Ohio wanted the nomination of John Sherman, and Garfield nominated Sherman in a remarkable address. But a large number of delegates were pledged to James G. Blaine, and a still larger number wanted to nominate Grant for a third term. The Grant adherents were the "stalwarts," led by Conkling and Arthur of New York; the opposition to Grant gloried in the name of "half-breeds." For thirty-three tiring ballots Grant had 306 of the 700 votes in the convention, the remainder being divided among Blaine, Sherman and George F. Edmunds. Garfield had



ELECTION OF 1880

Garfield and Arthur received 214 electoral votes from Republican states; Hancock and English received 155 Democratic votes.

received one or two votes from time to time, but had not been seriously considered until the thirty-fourth ballot, when Wisconsin gave him thirty-six votes. On the thirty-sixth ballot he received a majority of the votes, and was declared nominated.

In the campaign which followed Garfield established a new precedent by making speeches in his own behalf in Ohio, New York and several other states. An attempt was made to connect him with the Credit Mobilier (which see), but no proof of personal corruption was ever offered. That the people at large believed in his innocence was shown by the result of the election, in which he received an electoral vote of 214 to 155 for Winfield S. Hancock, the Democratic candidate.

Garfield's Brief Administration. When Garfield entered office, it seemed that his administration was to be most successful. Both publicly and privately he announced his desire to unite all factions of his party and of the people in his support, but his hope was not fulfilled. With the exception of Robert T. Lincoln, Secretary of War, his strong Cabinet was composed entirely of "half-breeds," Blaine himself being Secretary of State. The President, however, recognized the stalwart faction in the nomination of about a dozen important officers in New York, all apparently with the approval of Conkling and Platt, the Senators from that state. Then he sent to the Senate the nomination of William H. Robertson as collector of the port of New York. Robertson was one of Conkling's bitterest political foes, and Conkling tried to prevent confirmation. The Republican Senators, yielding to Conkling's wishes, agreed in caucus to allow the nomination to lie over from May until December. This was a victory for Conkling, but the President met this move by withdrawing the dozen nominations which pleased Conkling. Conkling and his colleague, Senator Platt, thereupon resigned and appealed to the New York legislature for reëlection to vindicate the right of Senatorial patronage. The legislature refused to reëlect them, and meanwhile the nomination of Collector Robertson was confirmed.

On the morning of July 2, 1881, President Garfield was in a holiday mood. Twenty-five years before he had been graduated from Williams College, and on this day he was to go back to his *alma mater* for his twenty-fifth reunion. As he was walking through the railway depot in Washington, arm in arm with

Outline and Questions on James A. Garfield

I. Early Years

(1) Birth and parentage
(2) Early need for hard work
(3) Beginnings of an education
(4) "On the towpath"
(5) In institute and college

II. Rapid Rise to Prominence

(1) Work as teacher
  (a) Reasons for success
(2) As president of Hiram College
(3) Interest in the slavery question
(4) In the state legislature
(5) As a soldier
  (a) Battle of Middle Creek
  (b) Gallant services at Battle of Chickamauga
(6) In Congress
  (a) Work on committees
  (b) Policy during Reconstruction period
  (c) Republican leader of the House
(7) Election of 1880
  (a) Garfield's place in Republican convention
  (b) Chosen as compromise candidate
  (c) Elected President

III. Administration

(1) "Stalwarts" and "half-breeds"
(2) Break with Conkling
(3) Star Route frauds case tried
(4) Death at the hands of a disappointed office-seeker

IV. Summary

(1) Not a great genius
(2) Remarkable rise to power due to industry and perseverance
(3) Rank as an orator

Questions

What characteristic reason did Garfield give for not attending a college of his own religious denomination?

When did he give up a promising career because he was convinced that he could do more good elsewhere?

What was the motive back of the assassination of the President?

What particular form did the love of adventure take in the boy Garfield? What was the outcome of his search for adventure?

Who were the "half-breeds," and what part did they play in Garfield's brief administration?

In how many fields did Garfield win distinction?

Why may it justly be said that his rise to fame was more rapid than that of almost any other American?

On what important committees did he serve in Congress?

What were Garfield's favorite books when he was a child?

Of whom was his regiment chiefly made up at the outbreak of the war?

Tell how he happened to be nominated for the Presidency.

Give his significant comment on the death of Lincoln.

What led him to take his first interest in politics?

Why did he never take the seat in the Senate to which he was elected?

James G. Blaine, he was approached by Charles J. Guiteau, a lawyer who had sought in vain to be appointed United States consul-general at Marseilles, France. Guiteau suddenly raised a pistol and fired twice at the President, the second shot taking effect. The President was carried to the White House, where he suffered for ten weeks. Towards the end of the summer his condition became worse, and the doctors decided that his only chance for recovery lay in removal to a more invigorating climate. On the sixth of September he was taken to Elberon, N. J., but blood poisoning developed in about ten days, and on the nineteenth of September, 1881, he died. His body now lies in a splendid tomb in Cleveland, Ohio. Guiteau, the assassin, was a "stalwart" Republican, and when arrested after the shooting declared frankly that it had been his purpose to throw the government into the hands of Vice-President Arthur. It was apparent, however, that Guiteau was mentally unbalanced, and had no conception of the awful nature of his crime, for which he atoned with his own life.

His Family. Two of Garfield's sons achieved distinction in several fields. HARRY AUGUSTUS GARFIELD (born 1863) was a prominent Cleveland lawyer, professor at Western Reserve University and at Princeton University, and since 1908 has been president of Williams College, his own and his father's *alma mater*. JAMES RUDOLPH GARFIELD (born 1865) also studied law, was for several years commissioner of corporations in the Department of Commerce and Labor, and from 1907 to 1909 was Secretary of the Interior in President Roosevelt's Cabinet. W.F.Z.

Consult Thayer's *From Log Cabin to White House;* Ridpath's *The Life and Work of James A. Garfield.*

GARFIELD, N. J., a residential and manufacturing borough of Bergen County, and an important suburb of Passaic (which see). The two cities are separated by the Passaic River. Garfield is in the northeastern part of the state, twelve miles north and west of New York City and five miles by trolley southeast of Paterson. It is served by the Erie Railroad and by trolley lines to all of the near-by cities and towns. A ferry runs to 130th Street, New York, near Grant's Tomb. The borough is more than two square miles in area. The population, largely American, was 10,213 in 1910, and 14,429 by a Federal estimate in 1916.

The principal industrial plants include woolen mills, chemical works, machine shops, rubber, knitting, embroidery and jewelry-case works, paper-box, wax-paper, clothing and cigar factories and artificial-stone works. There are more than 6,000 persons employed in these manufactories, and the value of their annual production amounts to over $16,000,000. Garfield, which received its name in honor of President Garfield, was incorporated as a borough in 1898. It is a city of many attractive residences. The public schools do not include high school courses, which are supplied by Passaic and Hasbrouck Heights. M.C.W.

GARGLE, *gahr'g'l.* When the throat becomes sore, a wash made of simple, soothing and healing medicines, called a gargle, is used to cleanse and heal the sore part. In using it, the head should be thrown well back, and some of the liquid should be churned about in the lower part of the throat. One must be careful not to swallow any of the liquid, for, even though it may contain simple drugs, the stomach may be injured. Boric acid or salt combined with water is a good disinfectant. A good gargle for sore throat is listerine, 1 part; glycerin, 1 part; and water, 1 part. Another of equal value is potassium chlorate, 1 part; glycerin, 4 parts; and water, 10 parts. If the gargles do not cure the throat quickly, it is best to consult a doctor.

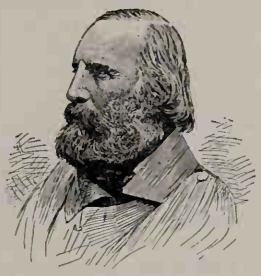
GARGOYLE, *gahr' goil.* On the upper corners of many ancient cathedrals and palaces built by the Goths in the thirteenth and fourteenth centuries, were weird, half human and half animal or birdlike stone figures called

ON NOTRE DAME, PARIS

gargoyles, which served as waterspouts. These figures were made on a few buildings earlier than the period named, but they were used extensively in Gothic architecture. On the roof of Notre Dame in Paris, where they cannot be seen unless ascent is made to the top, are some of the most famous of these strange figures, but these famous "devils of Notre Dame," as they are called, seem to have no architectural use. Modern architects use metal pipes to carry the water from the roof and very seldom add any ornament. The Univer-

sity Club building in Chicago, called the most perfect Gothic structure in America, is built with gargoyles on its upper corners, representing weird animal heads.

GARIBALDI, *gah re bahl' de,* GIUSEPPE (1807-1882), a patriot and military hero of the struggle that freed Italy from foreign rule and gave it a place among the modern nations of Europe. In his youth and early manhood he followed the life of a sailor, but at the age of twenty-six came under the influence of Giuseppe Mazzini (which see) and other young enthusiasts of the liberation movement, and he thereupon dedicated his life to that cause. Condemned to death in 1834 because of his share in an unsuccessful outbreak in Genoa, he fled to France and soon afterwards made his way to South America. There he won fame as a brilliant leader in the struggle of the new republic of Uruguay against Argentina.



GARIBALDI

In 1848 the news of the uprising of the Northern Italians against Austria brought him back to his country to give heroic but ineffectual service in a struggle that left Italy still in the hands of an oppressor. When this revolution failed, Garibaldi took refuge in Genoa, later reaching Tunis, and after that emigrating to the United States. During the next few years he revisited South America, and for a time had command of an American trading vessel on the Pacific coast. In 1854 he returned to Europe, settling on a small farm on the island of Caprera, in the Mediterranean Sea.

In 1859, when the Italians again struck for liberty under the standard of the king of Sardinia, Garibaldi began the most momentous period of his career. His brilliant and effective services of that year were continued in 1860 in a spectacular conquest of the island of Sicily, which he wrested from the king of Naples with the aid of a band of volunteers. This victory was followed by his triumphal march into the city of Naples (see SICILIES, KINGDOM OF THE TWO). In the words of an eminent historian (Myers), "The adventurous daring of the hero Garibaldi changed the kingdom of Sardinia into the kingdom of Italy." He then resigned his command to the Sardinian king, Victor Emmanuel, and retired to his island farm.

Garibaldi, however, was still far from satisfied with what had been accomplished, and his impatience to see the city of Rome again the capital of Italy led him to make two attempts to capture it. In his second invasion of the Papal States, in 1867, he was defeated by French troops who came to the aid of the Pope, and was made a prisoner. Later he was permitted to return to his island home.

On the outbreak of the Franco-German War in 1870 he took command of a company of French volunteers in Burgundy, and at the end of the war was elected a member of the French Assembly. Meantime he saw the fufilment of his hopes in the complete unification of Italy, with the Eternal City the national seat of government (see ITALY, subtitle *History*). He performed his last public service as a member of the Italian Parliament, to which he was elected in 1874. See, also, VICTOR EMMANUEL II.

Consult Henty's *Out with Garibaldi;* Trevelyan's *Garibaldi and the Making of Italy.*

GARLAND, HAMLIN (1860-), an American novelist and poet, whose realistic pictures of Western life present a different West from the romantic country of lawlessness and picturesque wildness about which so many authors have written. His stories are of the new West, an empire that was carved slowly out of the American wilderness.

HAMLIN GARLAND

Main-Traveled Roads is a book of six Mississippi Valley stories, written in Garland's happiest style. His volume of twelve essays, entitled *Crumbling Idols,* deals chiefly with literature, painting and the drama. The story *Up the Coule* has been described by critics as a "little picture worthy of Millet"—a story centered around a farm in a valley.

Garland took an active part in the experiences he recounts. When he was ten years old he plowed seventy acres of land. Half of his early life was spent on horseback and in

the meadows. Many recollections of his days on the farm are found in the volume of verse entitled *Prairie Songs*. *Harpers Weekly* published his first poem, *Lost in the Norther,* and paid him $25.00 for it. *Cavanagh,* one of his latest books, is a novel dealing with the conservation of forests. The introduction was written by Gifford Pinchot, one of America's chief advocates of conservation.

Hamlin Garland was born in the LaCrosse Valley in Wisconsin, in September, 1860. When he was seven years old his parents moved to Winneshiek County, Iowa, and it was there that the author got his first vivid impressions of Nature. Among his novels not named above are *The Rose of Dutcher's Coolly, The Eagle's Heart* and *Captain of the Gray Horse Troop.* Besides his novels, verses and criticisms, his sympathetic biography of Ulysses S. Grant occupies a prominent place in literature. Mr. Garland married Miss Zuleme Taft of Chicago, who has achieved some fame as a sculptor.

GARLIC, *gar'lik,* is a well-known seasoning with many valuable properties, but its strong, penetrating odor makes its wide use undesirable, and it has no food value. In Spain and among the Italians it forms a part of almost every dish. Like the onion, garlic is very easy to cultivate and is raised from the smaller edible bulbs, or *cloves.* The leaves of the plant are grasslike, like those of the onion, only not hollow. The stem grows about two feet high and bears white flowers. Wild garlic, sometimes called wild onion, is a pink-flowered pest in pastures in Eastern America, for it imparts a very disagreeable flavor and odor to dairy products.

GARLIC
As offered for sale.

Garlic has been used from the earliest times. It is mentioned in the Old Testament as being part of the food furnished the builders of the Pyramids. The juice of the garlic is also used as a cement for mending glass.

GARNEAU, *gar no',* François Xavier (1809-1866), a French-Canadian historian, the author of one of the standard histories of Canada. He was born in the city of Quebec, attended the Quebec Seminary, and from 1844 to 1864 was clerk of the local municipal council. His history of Canada, though it had an immense success when it first appeared in 1845, is occasionally marred by lack of sufficient data and is throughout a defense of the French-Canadians rather than an impartial account of the past. Yet its distinction of style has made it live, and if for nothing else it is important as the first great attempt in literature to stimulate racial self-respect among the French-Canadians. Garneau's son, Alfred (1836-1904), is remembered for a volume of poems remarkable both for form and for delicacy of feeling.

In 1917 his history of Canada was being edited and revised by his grandson, Hector Garneau, chief librarian of the new library at Montreal. G.H.L.

GAR'NET, a beautiful semi-precious stone which usually shades from deep red into brown or black, although some varieties are yellow and brilliant green. Dana, an authority on minerals, divides the different varieties of garnets into three groups, according to their composition; these are aluminum garnets, iron garnets and calcium-chromium garnets. In the first class are the brilliant, deep-red stones, called pyropes, or Bohemian garnets, which were first found in Bohemia, but now come from the Kimberley mines in South Africa and from parts of New Mexico and Arizona, where they are misnamed "Arizona rubies." The almandite, or common red garnet, belongs in this class, too, and is found in parts of North Carolina and Idaho and in India. These two, the pyrope and the almandite, the birthstones of January, are the red garnets used in jewelry, and are the most valuable, being worth about two dollars a carat.

Many of the iron garnets are yellow shading into brown, red or green, and are found in numerous mountain ranges. The calcium-chromium garnets, which are emerald-green in color, are found in Siberia and some parts of Canada. Some varieties are not as hard as quartz, while others are much harder. They are found in slates, granite and limestone, and sometimes in lava beds.

The ordinary garnets, which are of little value, are frequently ground and used in polishing and cutting other stones, while crushed garnets are sometimes used instead of sand in making sandpaper. About 4,000 tons of garnets of low quality are mined in New York

state every year to be used in shoe factories for rubbing and polishing. Excellent imitations of the valuable garnet are made in Switzerland, Germany and France from a peculiar kind of glass called *strass*, or paste, and purple of Cassius.

GAR'NISHMENT, a legal notice in the nature of an attachment or execution by means of which credits, property or effects of a debtor in the hands of a third party may be held for payment of debts. A case of garnishment differs from a writ of attachment or execution in two particulars: no actual possession of the property in the hands of the garnishee is taken, and as a rule no specific lien is acquired upon the property or credits in the hands of the garnishee. It is commonly used for attaching the wages of a debtor to secure payment of a debt.

GARONNE, *ga rohn'*, the most important river of Southern France. It rises in the Val d'Aran, on the Spanish side of the Pyrenees, and flows in a northwesterly direction, emptying into the Atlantic Ocean after a course of about 400 miles. A few miles below Bordeaux, the most important town on its banks, it is joined by the Dordogne, the two streams forming the estuary called the Gironde. Ocean-going steamers navigate inland to Bordeaux, seventy miles from the sea. Smaller vessels reach Toulouse, where the Canal du Midi joins the Garonne and connects the Atlantic Ocean and Mediterranean Sea. The Garonne has thirty-two tributaries, drains an area of 38,000 square miles, and with its tributaries affords a commercial highway extending over 1,400 miles.

GARRICK, *gair'ik*, DAVID (1717-1779), the foremost of English actors, for a long time manager of Drury Lane Theater, London, and the author of numerous comedies. He studied for a time under the distinguished Samuel Johnson, and then studied law, but later his dramatic instinct asserted itself, and in 1741 he made his first theatrical appearance, in the character of Richard III. A notable success was achieved, and his fame as an actor was established. He was a Shakespearean enthusiast and in a large measure was responsible for the revival of Shakespeare's plays in their original form. His last appearance was on June 10, 1776, in *The Wonder*. He died in London three years later, and was buried under the Shakespeare monument in Westminster Abbey. Garrick's acting was distinguished by versatility and naturalness, the latter quality being distinctly opposed to the method of the period. His literary ability was not pronounced, although one of his farces, *The Lying Valet*, was very successful.

GARRISON, *gair'i son*, WILLIAM LLOYD (1805-1879), an American reformer and journalist, and founder of *The Liberator*, a newspaper that became famous as an opponent of slavery. He was born at Newburyport, Mass. His father was a sea captain who had deserted his family, and his mother became a nurse in order to support her children. In 1818 he entered the office of the Newburyport *Herald* as compositor. After his apprenticeship ended he became proprietor and editor of the *Free Press*, a short-lived paper in which the poems of Whittier, then unknown to fame, appeared. In 1828 he went to Boston and there met Benjamin Lundy, who was publishing in Baltimore the *Genius of Universal Emancipation*, a weekly periodical devoted to the cause of the abolition of slavery. Young Garrison was immediately won to the cause and joined Lundy, but against Lundy's wishes he urged immediate emancipation for slaves and the partnership was dissolved.

WILLIAM LLOYD GARRISON

He then returned to Boston and set up his own press, on which, New Year's Day, 1831, he issued the first copy of *The Liberator*. He was without money or influence, and was editor, typesetter, proofreader and distributor of the paper.

> In a small chamber, friendless and unseen,
> Toiled o'er his types one poor unlearned young man.
> The place was dark, unfurnitured and mean,
> Yet there the freedom of a race began.

Such was the tribute paid to him by the poet Lowell after reading *The Liberator*, in which the editor said, "I will be as hard as truth and as uncompromising as justice." From this time he was the leader of the anti-slavery agitation, but refused to take any part in politics. *The Liberator* soon attracted attention alike in the North and in the South. Hundreds of people threatened his life; and he was finally indicted for sedition and on October

21, 1835, was dragged through the streets of Boston and lodged in jail for his own safety. He visited Great Britain in 1833 in the furtherance of his crusade; and in 1865, after the total abolition of slavery in the United States, he was presented by his friends with the sum of $30,000 as a national testimonial. A bronze statue has been erected in Boston in his honor.

GARROTE, *ga rote'*, or *ga rot'*. In Spain and Portugal in former days people condemned to die were dressed in black and attended by a procession of priests were conducted to a public place of execution. After a criminal was seated, an iron collar, called a garrote, which was fastened to an upright post behind him, was placed on his neck and tightened by a screw until he was strangled. This was a very painful and inhuman punishment, for the man who screwed the collar did not always do it rapidly enough to kill the victim quickly. This revolting method is employed very little at present, for life sentence in chains is succeeding it in those countries as the penalty for murder.

GARTER, ORDER OF THE. In 1349 King Edward III of England established this Order of knighthood, which has become the most famous in Europe. The story is told that while the king was dancing with the Countess of Salisbury at a great court ball she lost her garter, and as he picked it up to hand to her he saw several persons smile and indulge in remarks. This made him angry, and he exclaimed in French, "Shame to him who evil

INSIGNIA OF THE ORDER

(*a*) The Garter; (*b*) the Star, worn on breast.

thinks." Then he added that he would make the little blue garter "so glorious that everyone would wish to wear it." Whether or not the story is true, the Order was founded, and only twenty-five members besides the king were at first admitted.

The emblem of the Order is a dark blue garter edged in gold, on which are printed the words which the king spoke, *Honi soit qui mal y pense*. The garter is worn on the left leg below the knee, on all ceremonial occasions. After the Order was reorganized in 1831, the membership was increased by including the Prince of Wales and descendants of George I and any foreign rulers who might be selected. There were several patron saints of the Order, but Saint George was considered the special patron, so the name, "The Order of Saint George," is a term sometimes used to refer to the Order. Recently the membership has numbered about fifty.

GARTER SNAKE, a general term which is applied to various small serpents, the best-known species being the ordinary garter snake

GARTER SNAKE AND FAMILY

found in the United States, Southern Canada and the lowlands of Mexico and Guatemala. The length of the adult snake is about three feet, of which from one-fourth to one-fifth belongs to the tail. The coloring varies in different localities. Although its bite is harmless, it will assume a threatening pose when attacked. Its strength and courage make it a successful adversary of many small animals whose superior size would seem to give them the advantage. It is partial to grassy places and the borders of streams where mice, toads and fish abound. The young are produced alive, from ten to twenty at a time, and are carefully guarded, the mother allowing some of them to enter her mouth for protection when threatened by danger.

GARY, *ga'ri,* ELBERT HENRY (1846-), formerly a judge of the state courts of Illinois, later head of the United States Steel Corporation and of the International Steel Association, America's greatest industrial group.

When he was corporation counsel of the city of Chicago and president of the Chicago Bar Association he helped to organize the Federal Steel Company, a two-hundred-million-dollar merger, and became its president. A few years

later, when the so-called "steel trust" was organized, there were many disputes among the large stockholders. The Carnegie and Frick interests were particularly antagonistic, and J. P. Morgan, the great organizer, wanted for the executive a man who was not identified with either faction. Gary, of the Federal Steel Company, was not opposing anybody; he was therefore selected to head the gigantic steel merger, which was named the United States Steel Corporation (which see).

ELBERT H. GARY
Head of the greatest steel company in the world, whose output exceeds yearly the combined production of all the steel companies of Europe.

Judge Gary takes the non-militant idea of industry. He believes in coöperation, not only as between capital and labor, but as between corporations and public interests. His first big problem was with regard to the attitude of the Steel Corporation towards its employees. His solution was to invite the employees to become stockholders. Stock was offered them on easy terms of payment at less than the market prices; about 23,000 responded immediately, and the number steadily increased.

When a boy he lived on a farm near Wheaton, Ill., and attended a country school. Later he attended Wheaton College and the University of Chicago, and at the age of twenty-one began practicing law in Wheaton. When the village became a city Gary was elected its first mayor. At thirty-six he became a county judge, later moved to Chicago and at forty-seven was elected president of the Chicago Bar Association.

It has been said of Judge Gary that he is not a mere captain of industry; he is called a statesman of industry. Gary, Indiana, "the steel city" founded by the United States Steel Corporation, was named for him.

GARY, Ind., a city of Lake County, the greatest steel-manufacturing center in the world. It is twenty-nine miles southeast of Chicago, on the southern shore of Lake Michigan, and on the New York Central; the Michigan Central; the Pennsylvania; the Wabash, and the Baltimore & Ohio railroads. The Elgin, Joliet & Eastern and other belt lines connect these roads with each other and with all others entering Chicago. There is also electric service between Gary and Chicago. The population in 1910 was 16,802; in 1916 the city claimed 40,000. Sixty per cent of the inhabitants are foreigners, among whom thirty-four nationalities are represented. The area of the city in 1916 was over twenty-one square miles.

Gary was created in 1906 by the building of the main plant of the Indiana Steel Company, of the United States Steel Corporation. The site offers the unexcelled advantages of a fine harbor, the rail- and water-shipping facilities of Chicago and a central location between the great iron ore region of the north and the inexhaustible coal supply of the south. The greatest steel markets of the world are close at hand; Chicago, one of the largest, is also the nearest. Other giant subsidiary plants in operation are the American Bridge Company, the Universal Portland Cement Company, the American Sheet and Tin Plate Company and the Coke By-Products Company. A huge branch of the Baldwin Locomotive Works was in course of construction in 1917. The Gary Screw and Bolt Works was one of the first independent plants to be erected here. Among other projected industrial establishments are those of the American Locomotive Works, the American Car and Foundry Company and the National Tube Company.

The educational activities of Gary are as unique as the industrial (see Gary School System), and the school and other public buildings are in keeping with the promise of the city. Among these are a $250,000 Y. M. C. A. building, the Gary-Carnegie Public Library, Mercy Hospital, the city hall and a number of handsome churches, banks and hotels. Gas from the blast furnaces and coke ovens is converted into light and heat for the city. The water plant, owned by the United States Steel Corporation, supplies water from two miles out in Lake Michigan. The city contains two parks, Jackson and Jefferson.

Until 1906 the location of Gary consisted of sand dunes and marshes. In that year the city was chartered and the Steel Corporation began the building of sewers and of mains and conduits for the distribution of water, gas and electricity. The city was named in honor of Elbert Henry Gary (which see).

GARY SCHOOL SYSTEM. Under the leadership of Superintendent William Wirt, a school

system has been developed in the "Steel City" of Gary, Indiana, which has attracted widespread attention. Important features of this system have been incorporated into the schools of other cities, notably in New York City, where several public schools have been reorganized under the personal direction of Superintendent Wirt, who gave one-fourth of his time to the New York work for two years.

The school program, of which Superintendent Wirt has elaborated nearly fifty variations since about 1903, is intended for what he calls the "Work-Study-and-Play School." The several factors in such a school program admit of combination in numerous ways, and he has never tried to design a program for use in all schools regardless of the varying conditions under which schools are located. He states that he has had only two fixed principles since he began the formulation of such programs at Bluffton, Indiana, in 1900. These principles are as follows:

> First: All children should be busy all day long at work-study-and-play, under right conditions.
>
> Second: Cities can finance an adequate work-study-and-play program for all children only when all the facilities of the entire community for the work-study-and-play of children are properly coördinated, with the school as the coördinating agent, so that all facilities supplement each other and the peak loads are avoided by keeping all facilities in use all of the time.

Just what children should do when at work, study or play; how they should do these things; when and where they should do them; what facilities should be provided or utilized for these purposes; and the amount of time to be given to them, may vary according to conditions in each city and in each school district within a city. With these things in mind we need only describe the "Gary Plan" as organized and operated under conditions which are more or less typical or ideal; remembering, also, that the system is conducted upon an efficiency basis intended to provide more time for children with less cost *per capita* for instruction, buildings and equipment.

A large school managed in accordance with this plan calls for a program which is too complex to be easily described or understood, so we will illustrate the technique of procedure by supposing a relatively-small school conducted in harmony with the essential principles of the system.

A School of the Gary Type. Let us suppose a school consisting of the eight grades with which all are familiar. Suppose, further, that each of the grades is divided into two sections, commonly known as "A" and "B." We have, in such a case, essentially two schools, and we may speak of them as such—the one consisting of the "A" sections and the other of the "B" sections of each grade.

To accommodate these two schools there would be needed a building with eight regular classrooms and eight or more other places for the accommodation of sections of pupils, such as are provided in auditoriums, gymnasiums, swimming pools, playgrounds, playrooms, laboratories, libraries, shops, etc. While the one school is occupied with the regular studies in the eight regular classrooms the other school is engaged in various special activities which are now included in the modern school program and which are conducted in such spaces as those mentioned, suitably equipped. The two schools alternate throughout an eight-hour day, exchanging places each hour, let us say, in the pursuit of a program made up of work-study-and-play. In the middle of the day one school is at luncheon while the other is occupied with either the regular studies or the special activities, the conditions being reversed the hour following. Spacious corridors are provided with lockers where each pupil keeps his personal belongings, and each teacher conducts the work of a department and teaches different grades throughout the day instead of teaching all subjects to a given grade of which she is in charge all day long.

In a typical work-study-and-play school program arranged by Superintendent Wirt for seventy-two classes divided into two schools of thirty-six classes each, these two schools alternate between "formal drill," "application departments" and "general work," each school giving two, two, and four of the eight daily periods, respectively, to the exercises classified under these heads. This program calls for sixty-four teachers for the seventy-two classes. Fifty-four teachers conduct work with the seventy-two classes in forty-three different classrooms, and ten teachers are required for the auditorium, playrooms or playgrounds, and library. In the ordinary school as many teachers as classes would be necessary, not counting numerous special supervisors.

The possibilities of such a program in congested centers of population where large numbers of pupils can be kept in school only part of the time, are easily apparent. This is one of the reasons why New York City, where the part-time problem has baffled solution so long,

was the first large city to make provision for the accommodation of duplicate schools in some buildings, operated under some such program as the above.

Ideally the "complete unit school plant," of which there should be a sufficient number to meet the needs of an entire city, should be located adjacent to or near a park, on spacious grounds to be used for playground and school-garden purposes. The building itself must be large and should contain classrooms for many classes in regular studies and an equal number, at least, of spaces properly equipped for the special activities involved in the work-study-and-play program. Pupils assigned to such a building, no matter how large the number be nor what grades may be represented, are organized into two schools which alternate in the use of the facilities provided, thus securing the maximum use of the "plant."

Thus situated and arranged, the "unit school plant" is a complete recreational as well as an educational center for a section of the city, for adults as well as children. In the daytime it may be a "complete" school, having all of the grades—kindergarten, elementary and high school. In the evening it is a "complete" center for social, recreational and continuation school purposes. On Saturdays it is a "complete" opportunity for voluntary work-study-and-play, and for pupils who need special help. In summer time it is a "complete" center for vacation school purposes.

A school program conducted in this manner furnishes many interesting possibilities. For example, one school or any number of individual members of it may come to the building an hour later in the morning than the other and remain an hour later in the afternoon. In this way each school or any number of its members may combine various out-of-school activities with the program pursued by them at the school building, such activities constituting a part of the eight hours of work-study-and-play. These out-of-school activities may be work at home, study under private teachers in some special subject, work in settlements, religious instruction in the churches, or work at any of the numerous "projects" having educational value for which the home or community furnishes a better opportunity than that to be found at the "school plant." Those members of a school who do not have such opportunities out of school are grouped into classes for any of the features of the work-study-and-play program which may be pursued by them most profitably, thus spending one hour more at the "school plant" than the others.

A "Complete Unit" School Plant. Vocational and pre-vocational training are provided for in the "complete unit school plant" by having a number of skilled workmen in charge of school shops which are engaged the year round in the equipment and repair of the school plants of the city, pupils working with them just as under an apprenticeship system. Instead of employing a large number of workmen from a dozen or fifteen different industries to put the school facilities in proper condition during the summer vacation, as is the case in other cities, the Gary school board employs a sufficient number of such workmen and keeps them continuously employed. In this way school shops, in which pupils may gain vocational insight and training, are provided at less expense than is usually entailed elsewhere for repairs. Indeed, balancing the output of these shops against the salaries of workmen and the cost of materials used, these shops are self-supporting. In some cases they are a financial asset instead of a liability, to say nothing of the educational opportunity provided. The printing shop provides work suitable for both sexes in printing, making note books, repairing and rebinding books, and the need of cuts for illustrating school publications, involving photography and photo-engraving, calls for other related lines of work. Moreover, the purchase, care and distribution of a great variety of school supplies and shop materials give experience in commercial and business methods.

As one observes the "plant" in operation he discovers that pupils are to be found in every part of it almost all of the day. Approaching the building he discovers them in the gardens or on playgrounds generously supplied with all kinds of apparatus and facilities made by pupils under the direction of workmen in charge of school shops. Many pupils are passing to and fro in the corridors, as is always the case at the brief intervals between the periods into which the day is divided. There are no cloakrooms, and since desks are used by different pupils in the evenings and on Saturdays, as well as during the regular school day, each pupil must keep up a line of communication with his locker, where he keeps the equipment needed during the varied activities throughout the day.

Much of this passing of pupils is accounted for in this way. In some rooms you find pu-

pils working at desks which are not only readily adjustable but also as readily convertible into work-benches. You may find a large group of pupils in the auditorium equipped with a stage, stereopticon, motion picture apparatus, player piano, organ, phonograph and such other furnishings as are helpful in mass instruction. Some pupils will be found in corridors where pictures, maps and specimens are on exhibition. Some are in laboratories, working, watching, "showing" or engaged in a regular class exercise. Some are engaged in drilling upon the "essentials," some are occupied with the arts and crafts, some are in the gymnasium and swimming pool, and so on.

Economic Use of School Buildings. The system provides for the more economic use of school buildings, especially where buildings are such as are necessary in the "complete unit school plant." When used in the manner described, such a building will accommodate about 2,400 pupils, instead of 1,200 when the school is conducted in the traditional way. It is obvious that a school system made up of such "complete" centers would cost less because of no duplication of expenses for sites, buildings, equipment, janitors, principals and instruction, the cost of the last-named item being materially reduced by departmentalizing the work and thus eliminating all overhead charges for special supervisors. The system also gives a better division of time between the old and new studies, the possibility of better teaching and adaptation of studies to individual pupils by reason of departmental teaching and a better use of time which pupils oftentimes, under other conditions, spend in a variety of harmful ways. The system, moreover, provides an escape from the "lock-step" system of graduation and promotion, making it possible to promote pupils by subjects instead of grades.

Such are some of the more important features of a school system in process of development in harmony with the two principles stated above—a system which seeks to bring together in a unitary way, with economy and efficiency in management, all the recreational and educational agencies of a city. W.P.B.

GAS. In some of the old books on chemistry we find the following story of the origin of the term *gas*.

The philosophers of the Middle Ages, who are now known as *alchemists*, were troubled by explosions caused by fire coming in contact with invisible contents of the vessels used in their experiments. Not understanding the cause of these explosions, they attributed them to the presence of evil spirits; in the seventeenth century a Flemish chemist applied the term *geest*, meaning *ghost* or *spirit*, to those invisible vapors, and from this we derive the word *gas*.

All matter exists under one of three forms—solid, liquid or gaseous, the most elusive of all. Many gases, as oxygen, hydrogen, nitrogen and carbon dioxide, possess neither color nor odor, and we can detect them only by their effect upon us or upon some substance placed in them. For instance, if a lighted candle is placed in a jar containing carbon dioxide the flame will be extinguished. On the other hand, if we fasten a lighted match to the end of a fine steel wire or the mainspring of a watch and place them in a jar containing oxygen, the wire or the watch spring will burn and throw off brilliant sparks. For these and other reasons the chemist feels as sure that these and other gases exist as that wood and stone exist, and by observations and experiments he has learned a great deal about these unseen substances.

Air is the gas with which people are most familiar. It was by studying air that learned men obtained many hints as to the habits of other gases. They discovered that gas shares certain properties with other kinds of matter. Although it is often invisible, tasteless and without smell, gas can easily be shown to have weight. It is the pressure of the air, for example, that sustains the column of mercury in the tube of a barometer. Everybody has experienced the push of the atmosphere when the wind blows; it often exerts a force so enormous as to level forests and sweep the masts from ships upon the sea. As compared with liquid or solid substances, the weight of a gas is, of course, quite small; water, for example, weighs nearly 800 times as much as air; and air, again, is about fourteen and a half times as heavy as hydrogen, the lightest known gas.

Early scientists thought of gas as a substance that never lost its airlike quality; it remained for Faraday, in the years 1823 to 1845, to show that this is not true. By applying cold and pressure he reduced most of the common gases to a liquid state. In 1869 Andrews showed that carbonic-acid gas cannot be liquefied if its temperature is above 88° F. (31° C.), but that only a moderate pressure is necessary to liquefy it at or below that temperature. It

has since been found that for each gas there is a similar *critical temperature,* above which it cannot be liquefied, however great the pressure applied. This accounts for the failure of Faraday and others to liquefy oxygen, nitrogen, hydrogen and carbon monoxide. All gases have since been liquefied (see LIQUID AIR), and this suggests that gas is more like a liquid than a solid, which is true. Both are known to the scientist as *fluids;* that is, both *flow* and are essentially formless, since they will assume any form.

Unlike a liquid, however, gas expands readily to occupy fully any space, however large. To get an idea of the habit of a gas, one may think of its ultimate particles, or molecules, as exceedingly small rubber balls in constant and violent motion. These molecules, so infinitely small that a volume of gas as large as the head of a pin would contain thirty million times as many molecules as there are people on the globe, fly hither and thither in space, jostling one another and striking and rebounding from the sides of any vessel or room that contains them. They deliver a bombardment of tiny blows, which results in the phenomenon we call gaseous pressure. This is the conception of the nature of gases which is commonly accepted among scientists. It is called "kinetic theory" of gases.

Boyle's Law. A seventeenth-century natural philosopher, Robert Boyle, noticed that when gas was compressed into a smaller space the pressure was increased. He announced that if the temperature of a gas remains constant, the smaller the space the greater the pressure. The pressure, moreover, is in direct proportion to the density; that is, when the external pressure is increased four times, the gas is forced to occupy one-fourth of its original space. It is easy to see why this is so, since the same number of molecules, confined in a narrower space, would deliver their blows against the sides more frequently.

Heat has a surprising effect on gas. It imparts energy to the molecules and causes them to deliver their blows with greater rapidity. This naturally results in a greater pressure in a vessel of the same size; if the walls are movable, the gas will push them out. Thus we say gas expands with heat, just as do nearly all other substances.

Charles's Law. A Frenchman named Charles reduced this truth to law by announcing that as long as the pressure remains the same the space filled by the gas will be increased by a constant fraction of its original volume for each degree of rise in temperature.

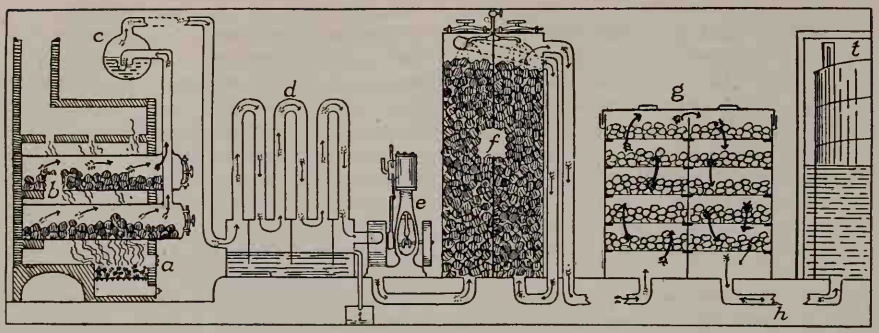
All gases obey these two laws with a fair degree of accuracy.

Illuminating Gas

Since coal in burning gives off flames, it hardly seems surprising that it should be made to yield a luminous gas. It was not, however, until the close of the eighteenth century that a Scotchman, William Murdock, showed in the most conclusive way that an inflammable gas could be extracted from coal. He succeeded in lighting his home and his office in Redruth, Cornwall, England, with such gas. After that it was not long until coal gas began to be manufactured in large quantities for lighting streets and houses. At the present time it is manufactured chiefly from coal but sometimes from oils derived from petroleum.

Coal Gas. Coal gas is formed by the distillation of coal. This is a rather complicated process, and it is carried out in huge gas plants. It may not be easy to understand at first how a solid can be distilled, and indeed the process is not exactly distillation in the same sense as we speak of the distillation of water or whisky. What is really done is to decompose the coal into gas and coke, a form of carbon. It is easy to imitate the manufacture of coal gas. Take a clay pipe and fill the bowl with soft coal; stop the mouth of the bowl with clay and allow it to dry well. Blow gently into the pipe to make sure that it is tightly closed by the clay. Then thrust the bowl into a fire. In a short time gas will issue from the stem, and if a match is touched to this gas, it will burn. Such crudely-manufactured gas is full of impurities, but still it is gas. When freed from impurities, it becomes the gas we burn in jet or fireplace.

The first process in making gas is to heat coal in fire-clay retorts. The retorts are oval or D-shaped in cross section. They are about nine feet long and 16x26 inches across the end, and they will hold from 250 to 350 pounds of coal. After charging they are tightly closed and heated in a furnace. In these retorts the carbon compounds of the coal are decomposed. The coke left in the retorts is used as a fuel or for the manufacture of carbons for electric arc lights. The gas passes off through a pipe, the



APPARATUS FOR THE MANUFACTURE OF COAL GAS

(*a*) Furnace; (*b*) retorts containing coal; (*c*) hydraulic *main;* (*d*) condenser; (*e*) exhauster; (*f*) scrubber; (*g*) purifier; (*h*) pipe leading to storage tank.

only exit from the retorts. Gas at this stage of its manufacture contains many impurities, such as tar, sulphur, ammonia, carbon dioxide and water vapor. The rest of the process is largely one of purification.

The gas leaves the retort and passes to a large U-shaped pipe containing water. In passing through the water, it is freed of much of its tar and ammonia. It is next forced by a rotary pump into a tar extractor, where more tar is removed at a temperature of about 100° F. The gas then passes to what is called the condenser. The condenser is built something like a tubular boiler; the gas passes through a set of tubes in one direction while water flows in the opposite direction outside the tubes. The gas is then forced by the exhauster (see diagram above) into contact in the scrubber with water in a cylinder containing coke, gratings of boards or other porous material. In the scrubber, more tar and ammonia are washed out, and the gas is then ready for the purifier. Here it passes through layers of lime or of oxide of iron, and loses any sulphur which it may contain. After this process it is ready for use, and is stored in huge tanks.

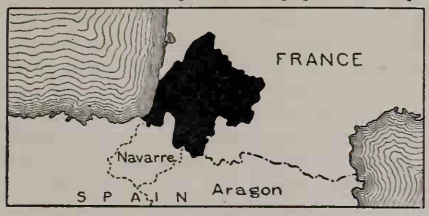
Water Gas. Water gas, which is now used in many cities, is made by passing steam over red-hot coke or anthracite (hard coal). This gas consists of hydrogen and carbon monoxide. It burns with a very hot blue flame. In order to render it useful for illuminating purposes, it must be "enriched" with gases that burn with a yellow flame. Frequently it is mixed with coal gas. Sometimes it is enriched by adding volatile liquids derived from coal or from petroleum. On account of the large proportion of carbon monoxide it contains, water gas is extremely poisonous, much more poisonous than coal gas.

Other Gases. Other illuminating gases are acetylene (which see); Pintsch, or oil, gas, made from petroleum, and used in lighting railway cars; Blau gas, also made from petroleum; and gasoline gas, made by vaporizing gasoline in a current of air. J.F.S.

GAS CLOUDS, in warfare, are designed to render the enemy helpless before an attack. In April, 1915, Canadian and French troops in the War of the Nations were surprised to see a heavy, greenish cloud creeping toward them along the ground at the rate of a few hundred feet a minute. From its effects the cloud is thought to have been composed of chlorine gas, of which a very small quantity produces a painful asphyxiation. Reference to the article CHLORINE will show that this gas is well suited to such a purpose, first, because of its heaviness; second, because it may be transported to the trenches in liquid form, and, third, because it is cheap. A satisfactory defense against gas clouds was found in cotton masks saturated with an alkali solution to absorb the chlorine. See WAR OF THE NATIONS.

GASCONY, *gas'ko ni,* an old province of France, north of the Pyrenees Mountains. It took its name from the Vascones, who crossed the mountains from Spain in the sixth century. They long maintained independence, but were finally subdued and ruled over by Frankish dukes. Gascony was the scene of many struggles between the French and English, who were at last driven out as a result of the victories of Joan of Arc. The Gascons were faithful and brave but much given to boasting, whence comes the word *gasconade,*

which means to brag or bluster. Dumas gives an admirable example of the popular conception of a Gascon in D'Artagnan, the hero of *The Three Musketeers.*

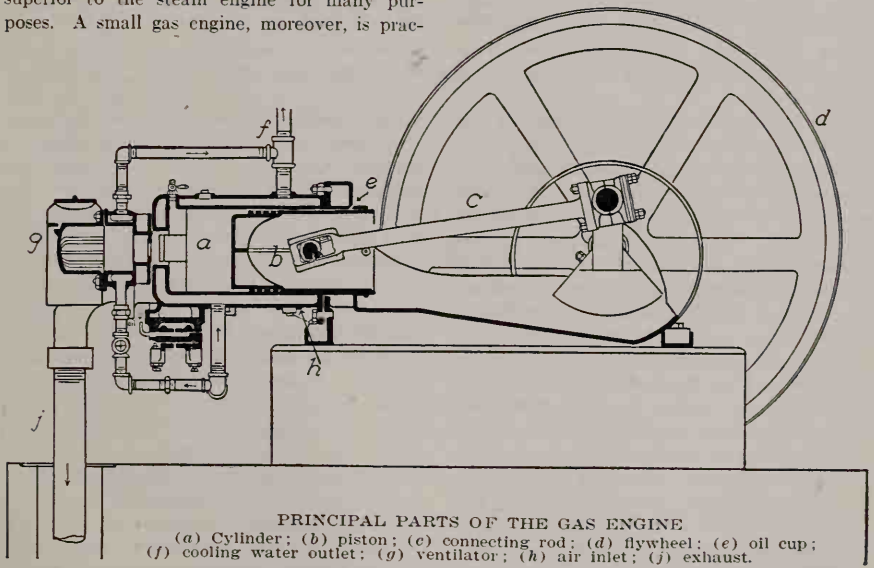


GASCONY

GAS ENGINE, an engine in which the motive power is produced by the explosion or combustion of gas in a closed cylinder. It is also called an internal-combustion engine. Such engines have reached a high degree of development in recent years, and are used for a variety of purposes. They drive automobiles, motorcycles and motor boats; they are used in factories of many kinds, and they furnish power for churns, plows, tractors and all sorts of machinery on the farm. Their comparatively light weight and small bulk make them superior to the steam engine for many purposes. A small gas engine, moreover, is practically as efficient as a large one, whereas a small steam engine is much less efficient than a large one. A gas engine is easily operated, and is instantly ready for use. For these reasons a small gas engine is the most economical and the most satisfactory power-producer if only a small horse power is required. For large power plants other forms of power-producers may be equally or more satisfactory; this fact depends on local conditions.

Kind of Fuel. The gas used may be natural gas, coal gas, producer gas, or a vapor produced from gasoline or any other petroleum product. Engines in which gasoline is used—and these are by far the commonest variety—are usually called gasoline engines. They differ from ordinary gas engines only in that the fuel must first be vaporized by means of a carburetor (which see). In stationary engines either liquid or gas may be used as fuel. In portable engines, such as those used in automobiles and motor boats, the liquid fuels are better, for they are usually cheaper, easier to handle and easier to obtain than compressed gases in storage tanks.

The Principles of Operation. A gas engine is an internal-combustion engine, that is, the combustion occurs inside the cylinder. The first requirement of such an engine is an enclosed space, in which combustion of the gas and the resulting increase of pressure may take place. This enclosed space, or combustion chamber, is the cylinder. One wall of this air-tight, gas-tight chamber must be adjustable, in such a way that the pressure from combustion may be used to perform work. This is



PRINCIPAL PARTS OF THE GAS ENGINE
(*a*) Cylinder; (*b*) piston; (*c*) connecting rod; (*d*) flywheel; (*e*) oil cup; (*f*) cooling water outlet; (*g*) ventilator; (*h*) air inlet; (*j*) exhaust.

accomplished by having a piston fit into the cylinder. When the gas in the chamber is exploded the piston is forced outward. This outward motion of the piston is controlled by a crank shaft. The crank shaft not only determines the distance the piston goes, but is itself rotated by the force of the piston's motion, and in turn draws the piston back to its original position.

Meanwhile, the condition in the cylinder deserves attention. When the gas in the compression chamber is exploded, by means of an electric spark, the combustion instantaneously raises the temperature of the gas, a temperature of 1500° C., or over 2700° F., being not unusual. This increase in temperature is accompanied by a tremendous expansion in volume. As the gas expands, it drives forward the piston with a pressure which may be several hundred pounds to the square inch. The burnt gases then escape through valves in the compression chamber, and a new supply of gas is admitted. When the piston returns, as explained above, by the motion of the crank shaft, it compresses the new supply of gas, and the entire operation is repeated. In a two-cycle engine there is one explosion for two strokes, forward and backward, of the piston, or for each revolution of the crank shaft. In a four-cycle engine there is one explosion for four strokes or two revolutions.

How Ignition or Explosion Is Produced. In practically all modern gas engines ignition is produced by means of an electric spark. The current may come from a magneto or dynamo, or from a storage or other variety of battery. The electric spark is made to jump between terminals which are fixed in the mixture to be ignited. These terminals are usually mounted in a spark-plug, which insulates one or both of the terminals, and is so constructed that it can be easily removed and replaced if broken.

Capacity of Gas Engines. The largest single gas engine in existence furnishes 2,000 horse power in its four cylinders. Greater power than this can be obtained by a combination of additional units. The smallest gas engine made has a capacity of only a fraction of a single horse power. W.F.Z.

Consult Wimperis's *Primer of the Internal Combustion Engine;* Carpenter and Diederichs's *Internal Combustion Engine.*

GAS'KELL, Elizabeth Cleghorn (1810-1865), a British novelist, whose books possess an irresistible quality of charm, was born in London in 1810. Her father had been a Unitarian minister, but gave up the calling to accept the position of keeper of records of the Treasury in London. Her mother died shortly after her birth, and the girl's childhood was spent with an aunt in Knutsford, near Manchester. Knutsford is Cranford, and the volume bearing that name attests the author's knowledge of the spirit of the place. She was married to William Gaskell, a minister of Manchester, when she was twenty-two, at which time she was noted for her remarkable beauty. Twelve years after her marriage the death of her only boy turned Mrs. Gaskell's thoughts to writing as an escape from sorrow.

Her first novel, *Mary Barton,* was published in 1848. The book had as its background the unending strife between employer and employed. Its practical result was to help create a better atmosphere, which meant ultimate improvement in social conditions. Charles Dickens was so pleased with the book that he invited Mrs. Gaskell to coöperate with him in *Household Words,* and to this magazine she contributed a great many stories and sketches. Among the latter, appearing from 1851 to 1853, were the separate sketches which became the chapters of *Cranford,* and which were published in book form in 1853. It is regarded as a classic, and stands higher in popular favor to-day than any other work of Mrs. Gaskell. *Cranford* is a chronicle of bright incidents which reveal the people and embody the spirit of a little town. It has a sunny humor, a tranquil common sense and a humanity that ranges from laughter to true pathos.

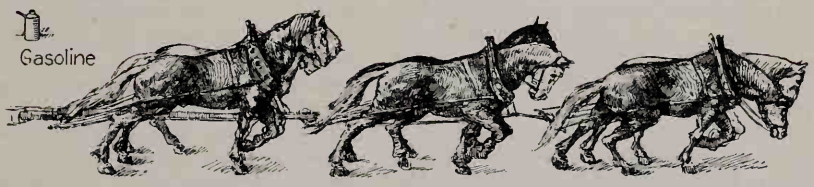
In the short period between 1860 and the year of her death Mrs. Gaskell produced three other stories, *Sylvia's Lovers, Cousin Phillis,* and an unfinished novel, *Wives and Daughters,* published in two volumes in 1866. M.R.T.

GASOLINE, *gas o leen'*, a highly inflammable liquid which looks like water, but is lighter and has a characteristic odor. Gasoline is one of the products of petroleum (which see). It is an exceedingly volatile liquid; that is, it evaporates rapidly on exposure to air. It cannot be kept in wooden barrels for any length of time, for no matter how cold the weather, it forces its way through wood. It must, therefore, be placed in metal receptacles, and the law requires that tanks containing it must be kept underground.

Uses. On account of the high explosive quality of suitable mixtures of gasoline gas with air, gasoline can be employed so advantageously that it has become within recent

years the most popular of all fuels for internal-combustion engines. This has been called the "gasoline age," so completely has gasoline superseded other fuels for supplying motive power for automobiles, trucks, tractors, flying machines and some forms of stationary engines. Automobiles by the millions have made such tremendous demands upon the supply that the price more than trebled in the half year between September, 1915, and March, 1916. From a rate as low as ten cents a gallon the cost to consumers advanced to over forty cents in some cities, and nowhere was it lower than twenty cents per gallon. The increase was not due to price manipulation; the supply could not keep pace with the demand, and manufacturers were called upon to devise methods for very largely increased production.

The Work It Can Perform. The power it is possible to develop from a gallon of gasoline



THE POWER OF GASOLINE TO DO WORK

Every minute that gasoline is properly employed in an internal-combustion engine it performs as much work as can be done by six horses in an equal length of time.

is one of the most remarkable developments of engineering. It will move a ton truck fourteen miles; propel a 3,000-pound automobile twelve miles, at the rate of forty miles an hour; run machinery to milk 300 cows; bale four tons of hay; plow three-fifths of an acre of land; mix thirty-five cubic yards of cement; keep eight electric lights burning for thirty hours.

How Produced. Until recent years gasoline was considered one of the waste products in the refining of petroleum. It was a by-product of kerosene; to-day kerosene is of secondary importance and is becoming a drug on the market, for the quantity of kerosene increases with the increasing production of gasoline. It is more than probable that science will some day develop ingenious methods which will give kerosene the fuel value of its by-product, for already some specially-equipped engines can use it.

To produce gasoline, petroleum is placed in a *retort*. This is a closed vessel. Through the agency of heat, gently increased during the process of refining, the petroleum is fractionally distilled into its component parts, in the order of their volatility—the lightest being separated first, and gasoline, which is not quite so light, second. From the retort the gasoline is passed through a coil of cold pipes, called a *worm*, where it is cooled; it is then passed to receiving tanks.

Recently the problem of increasing the yield of gasoline from petroleum has been successfully solved. The heavier oils left in the retort at the time the gasoline is distilled are vaporized and heated under pressure. At 500°-575° C. (930°-1070° F.) under a pressure of 250-300 pounds per square inch, good yields of gasoline are obtained. It is estimated that if these processes were generally adopted the petroleum deposits of the United States would last for over a hundred years, whereas at the present rate of production it is believed they will be exhausted in twenty-seven years. Attempts to manufacture gasoline from natural gas are also being made.

Amount of Production. The present annual production of gasoline in the United States is about one billion gallons. Of this, between thirty and forty per cent is exported. The amount produced in Canada is very small, practically all of the supply used in the Dominion being imported from the United States. Canadians get nearly twenty per cent more in every gallon than do purchasers in the United States, for in the Dominion the standard measure is the imperial gallon of 277.274 cubic inches, while in the American states the gallon is 231 cubic inches. See GAS ENGINE; AUTOMOBILE; TRACTION ENGINE. F.ST.A.

Consult V. B. Lewes's *Oil Fuel;* Butler's *Oil Fuel; Its Supply, Composition and Application.*

GASPÉ, *gas pay'*, PHILIPPE AUBERT DE (1786-1871), a Canadian novelist, author of *Les Anciens Canadiennes (The Old-Time Canadians),* an historical novel dealing with the old régime, when "seigneur, curé, censitaire and voyageur mingled in a life of feudal loyalty, religious zeal and stirring adventure." Brought

up among people who had themselves seen the end of the old régime, De Gaspé was always an eager listener to tales of the past, and he retells them with a whole-hearted pride in his race. As a novel the book is somewhat formless, and it rambles far from its plot, but its many digressions are the very features which make it live, for they are intimate pictures of the best features of seigniorial times. Aside from its connection with his books, De Gaspé's life is of little interest. He was born in Quebec, and he died there. He was a barrister by profession, and early in life was highly successful. Later, he suffered four years' imprisonment for not paying his debts, and thereafter lived a secluded life on his small estate.

GASTRIC JUICE. See Stomach.

GASTRITIS, *gas tri' tis,* an inflammation of the stomach, which occurs in several forms. There are three varieties of *acute gastritis.* One, known as *acute catarrhal gastritis,* has as its characteristic symptoms gas in the stomach, nausea, severe headache, vomiting (sometimes), diarrhoea or constipation and a coated tongue. It is due to eating spoiled food, to indulgence in ice-cold drinks or alcoholic beverages, to overeating and to certain infections, and is very common except in the case of the aged. Treatment consists in emptying the stomach with a tube or pump, and the administration of a purgative.. The patient should abstain from food for two or three days. This form of gastritis is not usually serious.

A second variety of acute gastritis is *toxic gastritis,* caused by alcohol, phosphorus, arsenic, corrosive sublimate and other poisons. Vomiting of blood, agonizing thirst, faint pulse and cold perspiration are typical symptoms, in addition to those of catarrhal gastritis. The body turns blue, and coma and death result in very severe cases. An antidote for the poison taken should be given, and the stomach should be washed out in some cases.

In *purulent gastritis,* the third variety of acute gastritis, small abscesses form in the submucous or muscular layer of the walls of the stomach. Symptoms of dyspepsia occur for several days, and are followed by burning pain, thirst, high fever, irregular pulse and vomiting of mucus and bile. The malady generally results in death.

Chronic gastritis has the symptoms of catarrhal gastritis, but these continue permanently. The victim suffers alternately from constipation and diarrhoea, and has a sallow skin, coated tongue and uncertain appetite. The disease is acquired commonly by men in middle life, and is caused by eating rich foods and overindulgence in the use of alcoholic drinks and tobacco. Treatment along hygienic and dietary lines is of most avail. Mineral waters are helpful in some cases, but drugs are almost useless. W.A.E.

GAS'TROPOD, one of a group of mollusks consisting of over 20,000 species, among them snails, slugs and limpets. These animals live in damp places under fallen trees or decaying logs, and on the bottom of ponds, rivers and lakes. Great numbers are found along the seashore and at various depths in the ocean, sometimes as far down as three miles. Characteristic features of gastropods are a distinct head, usually provided with tentacles, and a creeping "disk" which serves as a foot. Many of them have a one-valved shell, but in other species, such as the beautiful naked snails found along the coasts, the shell is entirely absent. See Mollusks.

GATES, Horatio (1728-1806), an American general during the Revolutionary War, gallant and able, yet so ambitious he injured his career and disappointed his friends. Gates was born in Essex County, England. He entered the English army at an early age, was rapidly promoted and was with Braddock and Washington in the disastrous expedition against Fort Duquesne in 1755. He was severely wounded in the battle, saw other active service in the French and Indian Wars,

GENERAL GATES

and after the peace of 1763 settled in Virginia. Upon the outbreak of the War of Independence in 1775 he was named adjutant-general by Congress. As first in command of the American army of the North he compelled the British General Burgoyne to surrender his entire force at Saratoga (1777), in what has been declared one of the decisive battles of the world.

He became president of the board of war, and in 1780 was placed in chief command in the South, where he boasted that he would

do to Cornwallis what he had accomplished against Burgoyne; in his own words, he was bent upon "Burgoyning Cornwallis." He was totally defeated by Cornwallis at Camden, however, his army was nearly annihilated, and in December he was superseded by Greene. A court of inquiry was appointed to inquire into his military conduct, but after careful investigation Greene concluded that Gates was not to blame for the disaster, and advised against holding the court. At the close of the war he retired to his estate in Virginia, and in 1790 he removed to New York where he died.

GATH. High above the plain on a hill in the Palestine of Bible times and surrounded by steep walls, stood Gath, one of the five royal cities of the Philistines. It was a hard place to capture and a very important fortress to hold. Warring nations fought to obtain possession of it and when David, Hazael and Uzziah captured it, they destroyed much of value within its gates. Gath was the home of a strong race of men, among them Goliath, who grew to manhood in this city and whom David slew. At present a small village is all that is left of the once famous city. In David's lament for Saul and Jonathan (*II Samuel* I, 20), he says, "Tell it not in Gath, publish it not in the streets of Askelon," for he fears that the daughters of the Philistines will rejoice over the death of these two great men. The expression, "Tell it not in Gath," is to-day used to mean, "Keep it secret."

GAT'LING GUN, a quick-firing machine gun, the original from which the most effective of the smaller weapons used in modern warfare have been evolved. It was invented by Richard Jordan Gatling during the War of Secession in America, and was afterwards adopted by all modern armies. The Gatling gun was practically a revolving rifle with ten barrels fired in turn. It had a capacity of 350 shots a minute, and was easily moved from place to place. Although superseded by the Maxim and other machine guns the Gatling gun possessed a few features that have not been improved. See MACHINE GUN.

Richard Jordan Gatling (1818-1903) was born in North Carolina. He showed great mechanical skill as a child and later assisted his father in perfecting a machine for sowing cotton seed. He also invented a hemp-breaking machine and a steam plow. The United States Congress voted him the sum of $40,000 to experiment in new methods of casting cannon. His greatest invention was the Gatling gun.

GAUGE, or **GAGE,** *gaje,* a mechanical appliance for registering the force of steam or the depth of water in boilers. The steam gauge consists of a metal box with a dial, over which an indicator, or needle, moves. Steam from the boiler enters a tube in which is a flat piece of metal connected with the needle by a rod and spring. The pressure of steam acts on the needle, forcing it round the dial face to indicate the pressure in pounds. Exactly the same principle is found in the ordinary spring scales used in grocery stores. A water gauge consists of a vertical glass cylinder connected with the boiler by metal tubes. The height of the water in the cylinder indicates the level of the water in the boiler.

GAUL, *gawl,* an ancient country, in the main identical with France, though larger than that country at present. Every schoolboy who begins the study of Latin becomes familiar with the name, for Caesar's famous *Commentaries*

GAUL

Boundaries at the time of the greatest extent of the Roman Empire, about A. D. 115.

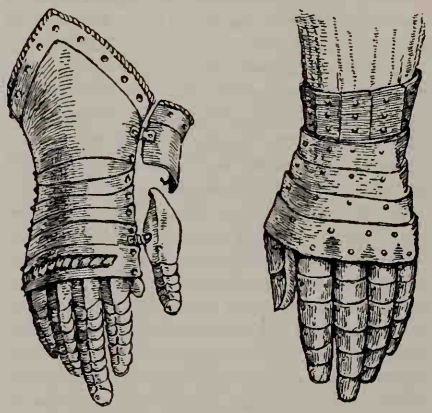
opens with the oft-quoted sentence, "All Gaul is divided into three parts." Caesar then goes on to describe these three parts and the people that dwell in them, who "differ among themselves in customs, in manners and in language" —the Belgae, the Aquitani and "those who in their own language are called Celtae, in ours, Galli." Caesar was not the first of the Romans to come in contact with the Gauls. Centuries before, the Gauls, whose territory extended from the North Sea to the Alps, had crossed that mountain barrier, swept down

through Italy and sacked and burned Rome (390 B. C.). The northern part of the peninsula they continued to hold, and thus there came into existence a *Cisalpine* or "this-side-the-Alps" Gaul, as distinguished from *Transalpine* or "beyond-the-Alps" Gaul. In the third century B. C. other tribes invaded Greece and Macedonia and finally crossed into Asia Minor, where under the closely similar name of *Galatians* they long retained their race characteristics.

Even brave and warlike as they were, they were no match for the organized forces of Rome, which began to force the Gauls little by little farther and farther northward, until at last they passed out of Italy altogether or submitted and became peaceful subjects of the republic. Still they were too powerful, however, for Rome to desire them as a neighbor just beyond the Alps, and Roman invasions into Transalpine Gaul began. During the second century B. C. the Romans made themselves masters of the strip along the sea, from the Alps to the Pyrenees, but not until the time of Julius Caesar did all Gaul come under Roman sway. From 58 to 50 B. C. Caesar carried on one campaign after another, and the battles were hard-fought, for the Gauls were no unworthy adversaries. "The bravest are the Belgians," wrote Caesar, and this tribute, in its original Latin form of *Fortissimi sunt Belgae,* was the inscription chosen for the proposed monument to the Belgians during the War of the Nations. The popular name for the part of Gaul won for Rome by Caesar was "Long-haired Gaul," because the Gauls did not keep their locks shorn.

During the time of Augustus, Gaul became an integral part of the Roman Empire and was organized in four provinces; this division persisted for four centuries. Later the history of the Gauls merged in that of other peoples—the Goths, the Burgundians and the Franks; and in time, out of the conflict the modern French nation was born. A. MC C.

GAUNTLET, *gahnt'let.* In the thirteenth century knights and soldiers began to wear a heavy leather glove covered with little plates of iron to match the rest of their armor. These were called *gauntlets,* and they were used throughout the Middle Ages. We still hear people use the expression, "throw down the gauntlet," which means "declare a challenge." When a man in medieval times considered that some one had wronged him, he would at once throw his glove, or gauntlet, down before him. The enemy, if possessed of the spirit of his day, would pick it up, as it was a challenge to fight, and the two men would arrange a time for battle. The battle was regulated by



GAUNTLETS OF THE FOURTEENTH CENTURY

fixed rules and was considered a legal trial. Whoever won was thought to be in the right, for it was believed that God gave the innocent strength to defeat the guilty.

GAUR, *gowr,* or **GOUR,** a wild ox of India, supposed to be the largest existing species of wild cattle. Specimens have been found whose horns measured thirty-nine inches in length by nineteen inches at the base. This, however, exceeds the average. The gaur is shining, blackish-brown in color, with pure white lower legs. It is a most desirable object of rifle sport in India, must be stalked on foot, and when cornered is extremely ferocious. Notwithstanding its fierceness when charged, it rarely attacks human beings except in self-defense. The semicivilized hill tribes of India have tamed it to a certain extent, although it has never been fully domesticated, and they also use it for food.

GAUZE, *gawz,* a light, transparent fabric, originally made of silk, but now manufactured from linen or cotton, the characteristic feature of which is its openness of texture. The word is apparently of Eastern origin, related to the Persian *gazi,* a thin, coarse, cotton cloth; but another interesting supposition is that it takes its name from the Syrian city of Gaza, where it is said to have first been made. The open texture of gauze is due to the manner of weaving; the warp threads (those that run lengthwise of the cloth) are not only crossed

as in ordinary weaving, but are twisted in pairs alternately from left to right and from right to left, after each shot of the weft threads (those that run crosswise). In this way the weft passes through a succession of loops in the warp and the threads are kept at equal distances apart, at the same time being held firmly in place.

Gauze fabrics are plain, figured or striped. At the present time China produces many choice gauzes worked with flowers of silver or gold on a silk foundation. Cotton gauze, made especially for the use of surgeons, is valued for antiseptic purposes. Light summer under garments made from woven fabrics of silk, linen and cotton are sold under the name of gauze underwear. The term is also frequently applied to bolting-cloth, used for sifting flour, and to the fine-woven wire cloth employed in window-screens, sieves and safety lamps.

GA'VIAL, a fish-eating crocodile of Northern India, which inhabits chiefly the basins of the Ganges, Indus and Brahmaputra rivers. It is distinguished from true crocodiles by the length and slenderness of its muzzle, characteristics which vary according to age and sex. It has numerous long recurved teeth, usually more than one hundred, especially adapted to its exclusive fish diet. It reaches a great size, often twenty feet in length, but owing to its slender and weak mouth and jaws is considered less dangerous than a crocodile of smaller proportions. Its feet are webbed, and it spends much of its time in the water.

THE GAVIAL

GAVOTTE, *ga vot'*. Among the peasants in France there originated a merry, light dance which was so well thought of that it was introduced at court in the sixteenth century. It received the name from the Gavots, the people among whom it originated. At first the gavotte in 2/4 or 4/4 time, was a bright, happy dance, but later it became a stately, formal affair. As a theatrical dance it became very effective and popular, and was worked out in many ways by Glück and Grétry. As a modern dance it is not popular in society, but is seen frequently on the stage; the Russian dancer, Pavlowa, has been its greatest exponent since 1910.

GAY, John (1685-1732), an English poet, famous for his *Beggar's Opera,* which was first acted in 1728. It ran for sixty-three nights, at that time a most remarkable achievement. In 1713 he published *Rural Sports,* which was followed by several pastoral poems in 1714, dedicated to Alexander Pope. This was the beginning of a lasting friendship between the two. Pope never tired of helping his friend. Gay had a great many patrons, and in 1720 he published *Poems on Several Occasions* by subscription, on which he realized £1,000, or $5,000. In 1715 his burlesque tragedy, *What d'ye Call It?* appeared, followed by *Trivia,* or *The Art of Walking the Streets of London.* A tragedy, *The Captives,* produced some years later, met with some success, and *Fables,* in verse, helped also to increase his reputation. He died in 1732 and was buried in Westminster Abbey. Pope wrote his epitaph, which is followed by a couplet of Gay's own:

> Life is a jest, and all things show it,
> I thought so once, and now I know it.

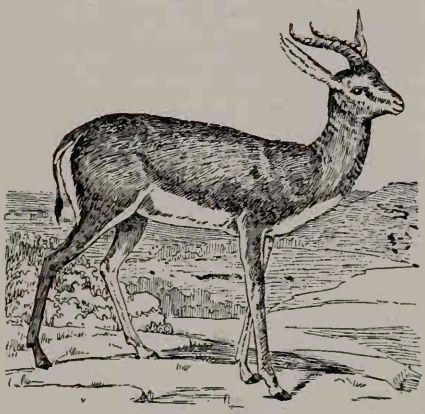
GAY-LUSSAC', Joseph Louis (1778-1850), a French chemist and physicist, and one of the most noted scientists of his day. He was an undaunted investigator of volcanic eruptions, having visited Vesuvius when it was in full eruption in 1805. He was also a fearless aeronaut, and did not hesitate to make an ascent 23,000 feet above sea level in a balloon to make observations of magnetism and also of the temperature and humidity of the air, collecting samples of air at different heights. His most important discovery was that oxygen and hydrogen unite in proportions of one to two to form water. This led to the discovery of the law of volumes, which is one of the most important discoveries ever made in chemistry.

His services to industry included his improvements in the processes for the manufacture of sulphuric acid and oxalic acid, methods of ascertaining the amount of real alkali in potash and soda by the volume of standard acid required for neutralization, and for estimating the available chlorine in bleaching powder by a solution of arsenious acid, etc. He also elaborated a method of assaying silver by a standard solution of common salt. Owing to the great benefits resulting from his experiments and discoveries, Gay-Lussac was the recipient of many honors, and in 1839 was made a peer of France.

GA'ZA, an ancient town of Syria, fifty miles southwest of Jerusalem and three miles from

the Mediterranean Sea. It is mentioned in the Bible as the scene of several of Samson's exploits. He carried away the gates of the city, and destroyed his enemies by pulling down the temple (see *Judges* XVI). The Philistines captured the city from the Egyptians and made it their chief stronghold. It was taken by Alexander the Great and later became an important Greek city. Now called Ghazzeh, it is an important commercial center with extensive manufactures of pottery and a large trade with Arabia, Persia and Egypt, carried over caravan routes. See SAMSON.

GAZELLE, *ga zel'*, a small, slender form of antelope to whose beauty, grace and gentleness frequent allusions are found in Oriental poetry. There are about twenty-three species confined to the north side of the Atlas Moun-



THE GAZELLE

tains, Egypt, Abyssinia, Syria, Arabia and South Persia. Some inhabit mountain ranges, others sandy plains. The common light-brown gazelle of rocky and desert lands, sometimes called *ariel,* or *dorcas,* is easily tamed and is a favorite pet of wandering Arabs, the name gazelle originating from an Arabian word meaning *to be affectionate.*

Gazelles in general are animals with large, soft and lustrous black eyes and round, black horns, some ringed, others plain, and found on both sexes; the ears are long, narrow and pointed; the tail is short, and the animal has smooth, short hair. There is a tuft of hair on the knees of some species. A common species has a light fawn-colored back, deepening into dark brown in a wide band which edges the flanks and forms a line between the upper parts of the body and the pure white abdomen. Gazelles are very fleet-footed and cannot be hunted by dogs. Falcons are often used for that purpose, or enclosures are made near their drinking places.

These attractive little animals feed on vegetation. A Sahara species, *Loder's gazelle,* is said to feed on berries and leaves and never to drink. *Grant's gazelle,* which stands about thirty-four inches high at the shoulder, has longer horns than any other species; the ordinary length is about ten inches, but the horns of the male Grant's gazelle reach a length of thirty inches. Another species of gazelle is the light chestnut-colored *Indian chinkara,* or *ravine deer,* of Asiatic plains. See ANTELOPE.

GEARING, *geer'ing,* a general term descriptive of mechanical appliances by means of which motion and power are communicated from one part of a machine to another. There are numerous forms of gear, the most common being cog wheels, endless belts, screws, or worm gear, friction wheels and eccentrics. Gear may be adapted to increase speed in the machinery to which the power is transmitted, or to give slower motion; these are known as *multiplying* and *retarding* gear, respectively. In *spur* gearing the teeth or cogs are arranged at regular intervals and with even depth round the surface of the wheel. *Beveled* gearing is made with the teeth running vertically on a wheel shaped like the base of a cone, and is used when shafts are at right angles to each other. Worm gear operates on the principle of the endless screw. When the gearing between two parts of the machinery is out of order, or purposely disconnected, the machine is said to be *out of gear.* It is *in gear* when connection is established. See SCREW, subhead *Endless Screw;* also, AUTOMOBILE, page 516, for explanation of gear shifting.

GECKO, *gek'o,* so called because of the peculiar cry, like *gekko,* uttered by some of the species, is a lizard of small size and repulsive

THE GECKO

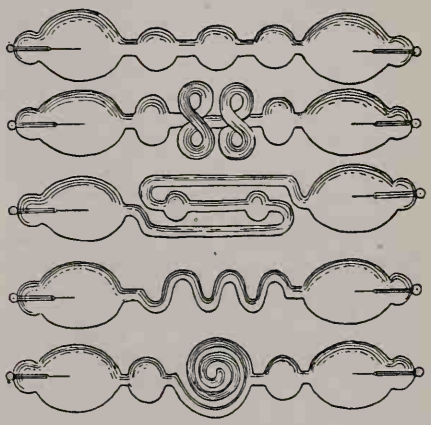
appearance. It is distinguished from other lizards by its peculiar formation, lack of eyelids, and adhesive feet which enable it to walk on a smooth wall or windowpane. It feeds

chiefly on insects, and is more or less active at night. It is found in warm climates, and is widely distributed throughout the world. It is generally regarded with disfavor as being poisonous and the carrier of disease, but there is no evidence to support such an opinion.

GEHEN'NA, the valley of Hinnom, just south of Jerusalem, where children long before the Christian Era were burned to death as offerings to Moloch. From the terrible suffering and sorrow connected with the valley, its name, which is an abbreviated form of two Hebrew words, *ge-hinnom,* meaning *valley of Hinnom,* grew to mean a place of eternal punishment, or hell. In ancient descriptions of hell the awful scenes in this valley were used as a foundation. King Josiah caused the valley to be used for sewage and other refuse, "that no man might make his son or his daughter to pass through the fire to Moloch" (*II Kings* XXIII, 10).

GEIKIE, *ge'ki,* Sir Archibald (1835-), Scottish geologist and author, considered one of the greatest geological authorities of all times. His textbooks are used both in Europe and the United States. He was born in Edinburgh, and after graduation at the University of Edinburgh became a member of the Geological Survey of Scotland, of which he was later made a director. He began his long list of works in 1858 with *The Story of a Boulder;* or, *Gleanings from the Note-Book of a Geologist.* After teaching geology and mineralogy in Edinburgh for eleven years, Geikie became director of the Museum of Practical Geology in London. He was elected president of the Geological Society of London and also became president of the British Association for the Advancement of Science. He visited America in 1897 and delivered a series of lectures at Johns Hopkins University and at McGill University in Montreal. Among his most important works are *A Textbook of Geology, Ancient Volcanoes of Britain* and *The Foundations of Geology.*

GEISSLER'S, TUBES, a name given to glass tubes used to show the brilliant effect produced by electricity when it is passed through a rarefied gas. They are named after Heinrich Geissler (1814-1879), a celebrated German scientific instrument maker, by whom they were first constructed. These tubes, made of very hard glass and of different shapes (as shown in the illustration), have a platinum wire sealed into each end, which serves as an electrode. The tubes are filled with various rarefied gases, such as hydrogen, oxygen, nitrogen, air, and so on. By connecting the electrodes to the opposite poles of an electric machine or to an induction coil, an electric current is passed through the tubes. The color of the light produced depends upon the shape of the tubes, the gas with which they



VARIOUS FORMS OF GEISSLER'S TUBES

are filled and the degree of rarefaction of the gas, and by varying these conditions very pleasing effects can be obtained. Geissler's tubes are also valuable in scientific research, such as examining various incandescent gases with the spectroscope.

Related Subjects. The reader is referred to the following articles in these volumes:

Cathode Rays	Electrode
Crookes Tubes	Roentgen Rays
Electricity	Spectroscope

GELATIN, *jel'a tin,* a transparent, brittle, yellowish substance obtained from the air bladder of fish and the bones, hoofs, horns, skin and muscle of animals. When bones are made into gelatin they are treated with muriatic acid; the mineral substances dissolve and leave only the cartilage. After this has been thoroughly boiled in water it dissolves and forms a crude *gelatin* suitable only for glue. To purify it, the gelatin is again soaked in hot water and filtered, while hot, in ninety per cent alcohol, a process which causes the impurities to settle at the bottom.

The best and purest gelatin is found in the air bladder of the sturgeon and, as it is easily digested, it is used as a food for invalids. In cold water it increases to five or ten times its weight, becoming an elastic, jellylike mass,

but in hot water it always dissolves; so in the pure state, which is one kind of *isinglass,* it is used to make jellies, blanc-mange and to thicken soup. The combination of tannin with gelatin in hides changes them to leather, and it is upon this principle that the art of tanning depends. In medicine pure gelatin capsules are made to contain bitter doses, and one variety of coating on pills is the same substance.

The "sizing" which is used to stiffen silks, gauze and linen, as well as that required in paper-making and in paints, is often gelatin; it is also an important ingredient of printers' rollers. In taking impressions and casts for making models of type, and in the manufacture of certain cements and courtplaster, gelatin is used. In combination with other substances it forms the copying-pad in a variety of copying processes, such as the hectograph; it is the coating for glass plates or films used for dry-plate photography, and is an ingredient in the films for moving-picture machines. S.L.A.

GELÉE, *zhe la',* CLAUDE (1600-1682), generally known as CLAUDE LORRAIN, after his birthplace in the village of Champagne in Lorraine. He was a celebrated French landscape painter, whose pictures were noted for the brilliant effects of light reflected in the sky, clouds and water, and for the poetic feeling shown in his interpretation of nature. He made his studies in the open field, where frequently he remained from sunrise till sunset, watching the effects of the shifting lights upon the landscape. However, his figures were not up to the standard of his other work, and so conscious was he of this deficiency that he usually engaged other artists to paint them in for him. He was wont to say that he sold his landscapes and gave away the figures.

After studying in Naples and Rome, he traveled through Germany and France and then settled in Rome for the rest of his life. In order to avoid a repetition of subjects and also to detect the counterfeit copies of his works, he made tinted outline drawings of all the pictures which he sent outside of France. On the back of each drawing he wrote the name of the purchaser. These books, six in number and called by him *Libri di Verita,* have been engraved and published and are still highly esteemed by students of the art of landscape.

Among his famous paintings are *Embarkation of Saint Ursula,* now in the National Gallery, London; *Finding of Moses,* in the Madrid Gallery; *Expulsion of Hagar and Ishmael,* at Munich; and the *Village Dance* and the *Landing of Cleopatra at Tarsus,* in the Louvre, Paris.

GELSEMIUM, *jel se'mi um,* or **YELLOW JASMINE,** *jas'min,* a climbing shrub, native of the United States, whose rootstock and rootlets yield a powerful drug called gelsemium. This shrub, with its opposite, lance-like, shining leaves and clusters of funnel-shaped, sweet-scented yellow flowers, grows near waters in rich clay soil from Virginia to Florida and Texas. There the odor of the flowers in the dampness of morning or evening is at times very noticeable.

Although the drug gelsemium is sometimes used in cases of malarial fever, rheumatism and neuralgia, it is not often used because of its dangerous qualities. A slight overdose will cause death. Drooping of the eyelids is the first symptom of too large a dose of the drug, and carbonate of ammonia, brandy, aromatic spirits of ammonia or morphine should be administered immediately. See JASMINE.

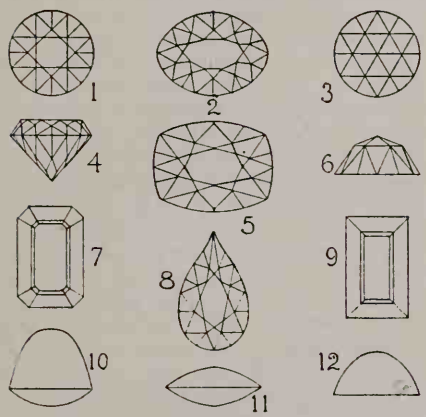
GEMINI, *jem'i ny,* or THE TWINS, in astronomy, is the name of the third sign of the zodiac, and also of a constellation now in the sign of Cancer. This constellation contains the summer solstice, the most northerly point reached by the sun. From this point it apparently commences its journey southward. The two brightest stars of the constellation are named for the twins Castor and Pollux, the sons of Jupiter and Leda. The symbol of Gemini is ♊. See ZODIAC.

GEMS, *jemz,* or **PRECIOUS STONES,** include all rare mineral crystals such as diamonds, rubies and emeralds, which, when cut and polished, are used in jewelry and ornaments. One beautiful, rare and enduring substance derived from animals, the pearl, is classed as a gem, as is also the fossil resin, amber. Coral is not a precious stone.

The word *gem* comes from the Latin *gemma,* meaning *bud.* Modest brown or dull-green buds burst forth into lovely flowers of beautiful hues, under the action of warmth and moisture and sunshine. The story of precious stones is very similar. From ugly lumps or "buds" of mineral matter, after a process of cutting and polishing, beautiful crystals are obtained which hold in their depths forever all the beautiful tints and hues which in flowers fade and die.

The value of gems is judged by their rarity, color, quality and hardness. The most valuable gems are diamonds, rubies, emeralds,

sapphires, opals and turquoises. A fine emerald often sells for more than a fine white diamond, and rubies are sometimes valued five and ten times higher than diamonds. The garnet, almandine, tourmaline, topaz, amethyst, moonstone, chrysoprase, chrysoberyl, aquamarine, heliotrope and azurite are of less value. Agate, lapis lazuli and carnelian are often cut as gems. The sources and values of the various gems are given in articles in these volumes under their individual titles. Few precious stones are produced in Canada and not more than $300,000 worth yearly are found in the



PRINCIPAL FORMS

Above are illustrated the usual forms in which gems are cut. The names by which they are designated are as follows:

(1) Round brilliant, top view
(2) Oval brilliant, top view
(3) Rose cut, top view
(4) Round brilliant, side view
(5) Cushion brilliant, side view
(6) Rose cut, side view
(7) Step cut, octagon
(8) Pear brilliant, top view
(9) Step cut, oblong
(10) High cabochon, side view
(11) Cabochon, side view
(12) Lentil-shaped, side view

United States, the most important of these being the sapphire. Over $30,000,000 worth of precious stones are imported into the United States in average years.

Although there is no doubt that brilliant stones were at first gathered for their beauty, it is also true that from earliest times gems have held definite meanings to people of all nations. Those who pretended to be learned about the stars (astrologers) believed that gems, as well as stars, influenced the lives of people, and from the first century it was believed that a special stone was dedicated to each month of the year. Even wise men and seers thought that the health and fortunes of individuals could be affected by the wearing of precious stones, and the stories of gems worn as charms are many. The study of carved and engraved gems and of precious stones set in strange designs by people of long ago brings to light many interesting beliefs and startling tales of deeds done for the mere possession of a single precious stone. Gems have also played an important part in religious superstitions, and frequently mention of precious stones is made in Scripture. The histories of kingdoms are woven about the jewels of royal families and of the nobility.

The art of engraving and carving gems held a high place among Greeks, Etruscans, Romans and Egyptians, and in modern times Italy and Germany have been the chief seats of the precious stone engraving art. Stones which have a design raised above the general surface are called *cameos;* those with the designs sunk below the surface are called *intaglios.* Some of the earliest specimens of cut gems are seen in scarabs, or beetle-shaped seals. Valuable and interesting collections of ancient gems are to be seen in museums in many of the large cities of the world, and private collections are prized by students or lovers of gems everywhere. Yet only about 10,000 really antique gems are in existence. The Morgan collection exhibited in the American Museum of Natural History, New York, is one of the largest.

Gems, Imitation and Artificial. The fascination of gems has caused an ever-insistent demand for them. Their rarity and costliness, however, make their possession impossible to many. So the jeweler's art developed into the imitation of precious stones, and chemists attempted to produce gems artificially.

Imitation of precious stones has existed since earliest times, and paste jewels, as they are called, have been so well made they cannot be told from the real by an inexperienced person. It has become a common custom for women to have paste copies made of their valuable jewels, to be worn at places where attempts at robbery might be made.

The Egyptians, who understood the art of coloring glass, made excellent imitations of the most costly precious stones known to them. Romans used powdered rock crystal in imitating gems. In the Middle Ages excellent imitations of the emerald, ruby, sapphire and topaz were produced. In modern times the basis of most imitation gems is a variety of glass known as *paste* or *strass.* This glass, which is remarkably clear and brilliant, consists of pure pow-

dered rock crystal, red lead and dry potassium carbonate. These ingredients are powdered carefully, mixed and then subjected to heat for about thirty hours. The quality of the resulting glass depends largely on the regularity of the temperature and slowness of cooling. The glass is colored to imitate precious stones by the same process used in making colored glass. This paste, uncolored, resembles the diamond, but is soft and can be scratched easily. By testing with a quartz crystal or piece of hard steel, an imitation is easily detected.

Some imitation gems are merely cheaper stones which very closely resemble the genuine. Clear quartz, white Brazilian topaz and colorless varieties of beryl, emerald and sapphire are often sold for diamonds. Colored varieties of quartz are substituted for other gems. Another form of imitation of gems is known as *doublet*. Thin pieces of genuine gems are attached to valueless backings in such a way that the entire stone seems genuine. The imitation of pearls forms an important industry. Hollow glass beads are coated on the inside with a preparation made from certain fish scales. If colored pearls are desired, dyes are added to the mixture.

Numerous attempts have been made in recent years to produce genuine gems artificially—to solve by human skill one of Mother Nature's mysteries. Diamonds, rubies, emeralds and other colored stones have been successfully made by the fusion of various substances by means of an electric furnace, and the industry has become an important one. At first the process was so expensive, and the stones produced were so small, that the experiment seemed impracticable for commercial purposes. The process was improved, however, and the manufacture of rubies, especially, was successfully accomplished in Paris. It is said that crystals weighing over forty carats and valued as high as $25,000 each have been produced. The annual output of rubies in the Paris factory is 5,000,000 carats annually, at an average cost to the manufacturer of twenty-five cents per carat.

Some Famous Gems. Among the celebrated diamonds of the world probably none has attracted more attention than the Koh-i-nur, presented to Queen Victoria by the East India Company in 1850. After being recut it weighed 102¾ carats; it is valued at $600,000. The Cullinan, found near Pretoria in the Transvaal, weighed originally 3,024¾ carats, or 1.37 pounds, and measured 4 inches by 2.5 inches by 1.25 inches. It was said to be worth from two and one-half to five million dollars. Since its discovery it has been cut into nine smaller stones. The Orloff, one of the most famous of the Russian crown jewels, weighs 195 carats. It was purchased in 1772 by the Empress Catharine II, who paid for it, according to the accepted story, $450,000, an annuity of $4,000, and a Russian title. There is a magnificent diamond in the Louvre, Paris, which weighs 136 carats and is valued at $2,500,000. This stone, called the Regent, is probably the finest of large brilliants.

One of the most beautiful pearls ever found is the Pelegrina, a pear-shaped stone weighing 134 grains, and described by an historian as being "as large as the largest pigeon's egg." It was presented to Philip II of Spain by a Spanish adventurer, and at the time was valued at 14,400 ducats ($28,800). This pearl was found off the island of Santa Margarita, 100 miles from San Domingo. After remaining in the possession of the Spanish royalty for many generations, it passed to a prominent Russian family.

Consult Kunz's *The Curious Lore of Precious Stones;* Wodiska's *Book of Precious Stones.*

Related Subjects. Each gem referred to in the article is described in its place in these volumes. In addition, reference to the following will add to the reader's knowledge of the topic:

Birthstones	Intaglio
Cameo	Lapidary
Glass (*Colored Glass*)	Scarab

GENDARMES, *jen darmz'*. The strength of the French army for nearly 450 years before the Revolution was in a body of heavily-armed cavalry, called *gendarmes,* which served as a bodyguard to the king. Each gendarme dressed in armor, and had five soldiers of inferior rank to wait on him. Since the Revolution the name has been applied to military police, nearly always comprising both infantry and cavalry. They are paid much higher wages than the rest of the army, from which they are picked because of their ability. Previous to the outbreak of the War of the Nations in 1914 there were 21,000 men in this service, who took care of many police matters connected with the government and were only sent into active service in case of an emergency. In time of war they keep order in the camp and on the march.

GENDER, *jen'der.* Just as living things are classed as male or female, and things without life as sexless, so in English grammar the words naming these things are said to belong

respectively to the *masculine*, the *feminine* or the *neuter gender*. *Neuter* and *gender* are derived from Latin words meaning *neither* and *kind*. Thus, gender may be defined as the property of a noun or a pronoun that indicates sex or absence of sex. It applies only to words, whereas sex applies to things.

The Simple and Logical Rule. As suggested, gender in the English language is natural—that is, determined by the sex of the object for which the word stands. All nouns or pronouns denoting the male sex are masculine: *he, man, cock, boy, king;* all words denoting the female sex are feminine: *she, woman, hen, girl, queen;* all words denoting objects without sex are neuter: *it, book, virtue, snow, knife.*

In most foreign languages gender has nothing to do with sex; it is grammatical, not natural—that is, it is governed by the form of the word. The German word for *girl (Mädchen)* is neuter in gender because it happens to have a neuter ending; *woman (Weib)* is also neuter, so that the German, as Mark Twain laughingly remarks in *A Tramp Abroad,* says, "The fishwife has dropped *its* basket of fishes." In German *fork* is feminine and *spoon* masculine, while in French both are feminine. "English stands entirely alone," says the grammarian Ramsey, "in making gender a rational and intelligible distinction." As a matter of fact, the gender of an English noun acquires real importance only when the third personal pronoun follows, for this pronoun must agree in gender with the noun to which it refers; thus, The queen was saved by *her* guard, who lost *his* own life in defending *hers.*

Gender Forms. No English noun has a distinctive neuter form, but there are some—relatively few in number—that distinguish the masculine and feminine in one of these three ways:

1. By different words for the masculine and feminine, which for convenience are usually learned in pairs; as, *husband, wife; son, daughter; bachelor, maid; monk, nun; wizard, witch; bull, cow; ram, ewe; gander, goose.*

2. By adding the suffix *ess, ine, trix* or *a* to the masculine to form the feminine. Of these endings, *ess* is the most common. This formation may or may not require some other change in the word; as, *actor, actress; duke, duchess; marquis, marchioness; prince, princess; hero, heroine; Paul, Pauline; czar, czarina; executor, executrix; sultan, sultana; signor, signora.*

3. By joining a distinguishing word to a noun of indeterminate gender (see below); as, *billy-goat; nanny-goat; he-bear; she-bear; man-servant; maid-servant.* This method, once very common, is gradually going out of use. In the case of animals, the modern tendency is to prefix the adjective *male* or *female* where necessary to distinguish; in the case of human beings, to use the masculine form for both, letting the context indicate the gender.

Common or Indeterminate Gender. Most nouns denoting living beings may refer to either sex; for example, *visitor, servant, cousin, parent, child, friend, hearer, bird, butterfly.* Such words are sometimes said to be of the *common gender*—sometimes termed the *indeterminate gender.* If such a noun in the singular is used to refer to both sexes, it is proper to follow it by the masculine pronoun, which stands for both genders; as, *Every person has a right to* HIS *own opinion*—not, to *their* own opinion, which is ungrammatical, or to *his or her* own opinion, which is cumbersome.

Special Cases. The sex is often disregarded and the pronoun *it* is used in referring to a very young child; as, *The baby dropped* ITS *ball; the child and* ITS *nurse were both ill.* Insects, small animals, and those animals with which man does not come in frequent contact are usually treated as neuter, while masculine or feminine gender is commonly assigned to the larger animals and those that mean most to man. Thus "he" is used for the dog, the cock, the horse, the elephant, the eagle; "she" for the cat and the hen; "it" for the ant, the fly, the squirrel, the rabbit. This is not, however, a hard and fast rule. When some inanimate object is spoken of as if it were alive, we have the figure of speech called *personification* (which see), things immense or sublime being treated as belonging to the male sex; those virtuous, lovely or fertile as belonging to the female sex. Thus, Shelley writes:

> How wonderful is Death!
> Death and *his* brother Sleep.

And Shakespeare pictures the dawn as a woman and the great sun as her lover:

> See how the morning opes her golden gates,
> And takes *her* farewell of the glorious sun!

The Changing Fashion. At one time distinctions of gender were considered so important in English grammar that forms like *teacheress, championess, neighboress* and the like were in everyday use. Not many years ago, in fact, *instructress, songstress* and similar feminine forms were considered good form. The present tendency is toward simplicity, and such gender terminations are being dropped as far as possible. To-day a woman writer is an *author,* a *poet* or an *editor,* not the old-fashioned

authoress, poetess or *editress*. It is just by freeing itself from distinctions of this character, based on Latin grammar, that English has developed into the wonderfully clear, compact and forceful instrument for expressing thought that is our heritage to-day. See GRAMMAR. L.M.B.

GENERAL EDUCATION BOARD, an organization chartered by Congress in 1903 to promote education in the United States. The board was created to assist in the distribution of large benevolences for educational purposes, especially those contributed by Mr. John D. Rockefeller. Through this organization assistance is given to schools of all grades, from the common school to the university, without distinction of race, sex or creed. It has been especially helpful in promoting education in the Southern states, though its activities extend to all parts of the country. The board controls about $34,000,000, the income from which is expended for educational purposes.

GENERALIZATION, *jen er al i za' shun,* the conclusion reached concerning the characteristics of a class of objects, by observing the qualities of several individuals of the class. A generalization is reached by inductive reasoning, that is, by observing particulars and drawing a general conclusion based upon these (see INDUCTIVE METHOD). For example, when similar traits are seen in many persons of the same nationality, the generalization is made that these characteristics belong to all people of that nationality. When it is observed that heat is transmitted more readily by iron, copper, steel and other metals than by wood, glass, rubber, etc., the generalization or conclusion reached is that metals are the best conductors. The term *generalization* is applied to the act of drawing the conclusion, as well as to the result of the process.

GENESEE, *jen e see',* **RIVER,** a beautiful stream flowing through Pennsylvania and New York, whose name, which is of Indian origin, means *shining valley*. It rises in the northern part of Pennsylvania, in Potter County, and follows a northward course into New York, entering Lake Ontario seven miles north of Rochester, and about 140 miles from its source. Just before the river reaches the broad and fertile valley at Mount Morris, New York, it cuts its way through a deep, narrow gorge whose perpendicular cliffs rise in some places 350 feet high; within this chasm it plunges over three cascades, one of which, Portage Falls, is 110 feet high. At the city of Rochester, where the river is crossed by the Erie Canal, it forms three waterfalls which afford excellent water power. Lake vessels can navigate the Genesee for five miles of its course.

GENESIS, *jen' e sis,* which means *origination* or *coming into being,* is best known as applied to the first book of the Bible. In this book the story of the creation of the world is told, and the story of formation of the chosen nation of God, the Israelites. After the appearance of sin in the world and the subsequent separation of good from evil, the Flood was sent to punish the wicked. Then the history of the world began again with Noah and his family as the only survivors. Many years after, God called Abraham to become the father of the chosen people of Israel, and the wonderful growth of his nation is told in the remainder of the book. When the crops failed one year and the people were suffering, Jacob, the grandson of Abraham, who had become leader of the nation, led all the people into Egypt, where his son Joseph had become the prime minister. At the close of the book both Jacob and Joseph die, leaving the people still in Egypt. It is a wonderful story of the primitive growth of a nation, and the splendid story of Joseph is one of the most striking tales ever written.

GENET, *zhe neh',* EDMOND CHARLES EDOUARD (1765-1834), popularly referred to in American history as "Citizen Genet," was a French diplomat who created the first international crisis which confronted the young American republic. After being attached to the embassies at Berlin and Vienna (1779-1780) he succeeded his father as chief of the bureau of correspondence in the French Department of Foreign Affairs. In 1792 he became minister to the United States, at the time of the French Revolution. He was enthusiastically received upon his arrival at Charleston, S. C., as a representative of a people striving for liberty; his reception was the heartier because Americans had not forgotten France's contribution to the success of the Revolutionary War.

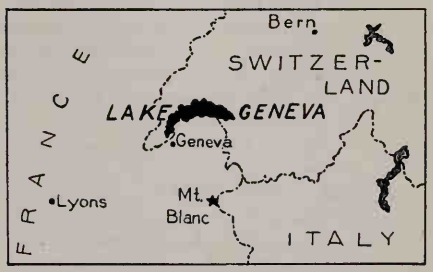
Despite President Washington's proclamation of neutrality Genet endeavored to influence public opinion to side with France. He proceeded to arm and equip privateers and raise recruits in American ports, clearly leading the United States to violate its neutrality between France and England. This, with his many imprudent criticisms of the government, compelled Washington to demand his recall in 1794. Fearing the dangers of the Revolution,

Genet did not return to France, but settled in New York City, became a naturalized citizen, and married the daughter of Governor George Clinton. See illustration, in article WASHINGTON, GEORGE.

GENEVA, *je ne' va,* distinguished as a theological, literary and scientific center, is a city of Switzerland, the capital of the Swiss canton of the same name. It is delightfully situated in full view of the Alps, at the western extremity of Lake Geneva, where the River Rhone issues and divides the town into two portions. The upper town contains the homes of its wealthy people, and many fine parks and hotels; in the lower town, which is the seat of trade, the poorer classes live. In the *Place des Alpes* is an imposing monument to Duke Charles II of Brunswick, who left 16,500,000 francs (nearly $3,300,000) to the city. Geneva is the birthplace of the writer Rousseau, the naturalists Charles Bonnet and the Pictets, the humorist Töpffer, the physicist De Saussure, and the sculptor Pradier. In 1536, when Geneva invited Calvin to make his home there, it became one of the greatest strongholds of Protestantism in Europe (see CALVIN, JOHN).

The ancient ramparts have been removed and many improvements introduced, for Geneva is one of the principal entrances for tourists into Switzerland. Its principal buildings are the Transition Cathedral of Saint Peter, dating from 1124; the town hall; the academy, founded by Calvin, with a library of 110,000 volumes and converted in 1873 into a university; the magnificent theater, ranking next in size to the Paris Opera; the Rath Museum and the Fol Museum, with collections of Greek, Roman and Etruscan antiquities; the Athenaeum, devoted to the fine arts; and the museum of natural history, containing De Saussure's geological collection. The staple manufactures are watches, clocks, musical-boxes, jewelry, gold and silver ornaments and scientific instruments; of these the city produces $10,000,000 worth annually. Population in 1910, including suburbs, 125,520.

GENEVA, LAKE, or **LAKE LEMAN,** the largest lake in Central Europe, is partly in Switzerland and partly in France. Its total area is 223 square miles, of which only eighty-three square miles belong to France. The whole of the lake is neutral territory, however, according to the terms of the Congress of Vienna (1815). The River Rhone enters the lake at the east, between Villeneuve and Saint Gingolph, and flows through the city of Geneva at the west. The lake is noted for the unusual clearness and blueness of its waters, and is surrounded by a mountainous region of great beauty. On its shores are many famous resorts, including Geneva, Lausanne, Ouchy, Vevey and Montreux. Many thousands of



LOCATION MAP

visitors annually flock to these. Near the eastern end stands the Château of Chillon, prison of Bonnivard, immortalized in poetry by Lord Byron in *The Prisoner of Chillon.* Pleasure steamers ply on the lake and a railway line runs along its northern shore from Geneva to Villeneuve. See an illustration, in article CHILLON, page 1339.

GENEVA, N. Y., a city in Ontario County, noted for its extensive nurseries and greenhouses, which cover about 10,000 acres of land. It is situated west of the geographical center of the state, at the north end of Seneca Lake and on the Seneca and Cayuga Canal, a branch of the New York State Barge Canal (which see). Rochester is fifty-two miles northwest, Syracuse is fifty-two miles northeast and Buffalo is 120 miles directly west. The city is served by the New York Central and the Lehigh Valley railways. Electric lines connect with cities east and west, and steamboats run between Geneva and Watkins, thirty-six miles distant. In 1916 a Federal estimate gave a population of 13,711, an increase of 1,223 since 1910.

The surrounding country is a rich agricultural and fruit-growing district, and some of the leading industrial establishments are dependent upon its resources. The annual output of one canning company, which employs about 500 people, is $4,500,000, and that of a cereal company is $3,000,000. Optical furnishings, cutlery, steam boilers, motor boats and stoves are among the important manufactures. Geneva is the seat of the state agricultural experiment station; of Hobart College, established in 1822 by the Protestant Episcopal de-

nomination, and of the Delancey Divinity School. Here also is located the Smith Astronomical Observatory. The post office, erected in 1906 at a cost of $100,000, a $100,000 city hall, a state armory and a $52,000 Y. M. C. A. building are the most notable buildings.

Geneva was settled in 1796 and was chartered as a city in 1898. It was named for the district of Geneva in Switzerland because of the similarity of its picturesque location to that of the European canton. The Indian village of Kanadesaga occupied a site near the present city; it was destroyed by General James Clinton in 1779. F.K.H.

GENEVA ARBITRATION. During the American War of Secession, a number of Confederate ships, notably the *Alabama*, did great damage to the commerce of the North by preying on its merchant vessels. As these Confederate ships had been fitted out in English ports and were permitted to sail therefrom, at the close of the war the United States government demanded that England pay damages for this violation of neutrality laws. On May 8, 1871, commissioners representing England and America signed the Treaty of Washington, which provided that the question of the claims against England should be decided by a board of arbitration, to meet at Geneva, Switzerland. The settlement of these claims is therefore known as the Geneva Arbitration. The tribunal, which consisted of distinguished statesmen from Switzerland, Italy and Brazil, awarded the United States damages to the amount of $15,500,000. See WASHINGTON, TREATY OF; ALABAMA, THE.

GENEVA CONVENTION, an agreement to better the condition of sick and wounded soldiers in time of war, entered into by nearly all of the nations of Europe at a conference held at Geneva, Switzerland, in 1864. The terms of the agreement, which have been accepted by every European government, by the United States and by several South American and Asiatic countries, are as follows:

(1) Ambulances and military hospitals are regarded as neutral as long as they contain sick persons.

(2) This neutrality is extended to the persons engaged in caring for the sick and wounded.

(3) The neutrality of these persons continues after the hospitals are taken by the enemy, and they must not be hindered from departing or remaining.

(4) If they depart, only their private property may be taken with them, except ambulances, which may be removed entire.

(5) A house containing a sick soldier is not to be used for the quartering of soldiers.

(6) Wounded men who are cured may return to their own country if they promise not to take up arms again during the rest of the war.

(7) Hospitals and ambulances must carry, in addition to the flag of the nation, a flag bearing a red cross on a white ground, and doctors and nurses must wear an arm badge of the same colors.

A second conference, held at Geneva in 1868, applied the principles of this agreement to war on the sea. It was then decided to declare neutral all hospital ships, merchant vessels having wounded on board, and boats picking up wounded or shipwrecked persons. These must carry the Red Cross flag, and their men must wear the arm badge. Government hospital ships must be painted white with a green stripe, and those of aid societies white with a red stripe. See RED CROSS SOCIETIES.

GENGHIS KHAN, *jen'giz kahn,* or **JENGHIS KHAN** (1162-1227), began his career at the age of fourteen years as the chief of a small Mongol tribe and soon displayed the marked military talent which made him one of the greatest conquerors in history. After much domestic warfare he subdued various Tartar revolts, and was proclaimed ruler of the united Mongol and Tartar tribes. Claiming a divine call, he so inspired his soldiers that they willingly followed him to battle. The most important episode in his career was the conquest of Northern China. After a series of lengthy campaigns, Pekin, the capital, was taken in 1215. Turkestan was next invaded, and two of its cities, Bokhara and Samarcand, were demolished.

In 1225 Genghis Khan, although then over sixty years old, attacked and conquered the king of Tangut (Southwestern China), who had harbored and refused to surrender two of his enemies. Worn with years and warfare, he then left further conquests to his sons, among whom, upon his death, his vast territorial possessions were divided.

GENII, *je'ne i,* as most commonly understood, those mysterious and fascinating spirits, familiar to every reader of the *Arabian Nights.* Some were good, assisting Aladdin to build his palace, sympathizing with the needs of humanity, and bearing a lover half across the world in the twinkling of an eye that he might look upon his loved one's face; but some were hopelessly evil, thwarting the powers of good in every possible way. A well-known example of this man-hating class is the one who threatened to kill his benefactor who had released him from the jar in which he was confined,

and was prevented only by the ruse of his deliverer in pretending to believe that he could not again squeeze his gigantic frame into the small jar. Incensed, the genie crept into it, and was promptly sealed in. These genii, or as they are also called, *jinns*, play a very prominent part in the Mohammedan religion.

Really, the word *jinns* is the proper name for the *Arabian Nights* spirits, and the term *genii* was applied to them by the translators who confused them in their minds with the genii (plural of *genius*) of the ancient Romans. To the Romans the genii were protecting deities which presided over the destinies of men. Each person had his own special genius, which led him into life, accompanied him during its course, interfered powerfully in his affairs and finally conducted him out of the world.

GENNESARET, *je nes' a ret,* LAKE OF, the former official name for the Sea of Galilee, which is described in the article GALILEE.

GENOA, *jen' o a,* popularly termed THE PROUD, is the northern gateway to the heart of Italy and one of the greatest seaports on the Mediterranean Sea. This city, with its centuries-old record of maritime glory, and of

LOCATION MAP

deathless fame as the birthplace of Columbus, is delightfully situated at the foot of the wide-circling Apennines. The slopes of the hills behind the city are covered with buildings, terraced gardens, and groves of oranges and pomegranate trees; while the summits of the loftier ranges are capped with a line of strong forts and batteries. Its fine harbors, which are equipped with modern quays and docks, welcome ships from all parts of the world. The exports, having an annual value of nearly $100,000,000, consist of cotton goods, fruits, wine, olive oil, silk goods, coral, paper, soap, macaroni and marble.

Genoa is a city of palaces, splendid in architectural beauty. Whole streets of wonderful buildings invite the visitor to their great halls, where the medieval nobility once dreamed of greatness and of war, and of the wealth that picturesque caravels brought to them from the lands beyond the seas. To Columbus, Genoa's most famous son, there is a fine monument sculptured by Canzio. Victor Emmanuel, first king of United Italy, and Mazzini, the Italian patriot, who was born in this city, are likewise honored by imposing monuments. The city is noted for many fine churches, and is well supplied with technical schools and institutions for higher education. There are also numerous philanthropic foundations, a fine library and an Academy of Fine Arts. Its Carlo Felice Theater is one of the largest in Italy.

History. Genoa was famous as a seaport under the Romans. After the breaking up of the empire of Charlemagne, it constituted itself a republic presided over by doges (see CITY STATES). From 1119 to 1284 it was almost constantly at war with Pisa, in which Genoa was finally victorious. The twelfth century marks the beginning of a long series of wars with Venice for commercial supremacy in the East. In the meantime, civil dissensions exhausted and demoralized the state, and occasioned many changes in the primitive form of government. In 1528 the disordered state regained tranquillity, which continued to the end of the eighteenth century. The form of government established was a strict aristocracy. Little by little Genoa lost all its foreign possessions. Corsica, the last of all, was ceded to France in 1768. In 1800, after the Battle of Marengo, the city was taken possession of by the French. Five years later it was formally annexed to the empire of France, and in 1815 to the kingdom of Sardinia, with which it became a portion of United Italy (see ITALY, subtitle *History*). Genoa is sixth in size among Italian cities. Population of city and suburbs, 1914, 292,130. R.D.M.

GENSERIC, *jen' ser ik* (440-477), a powerful king of the Vandals who conquered all Africa west of Carthage in A. D. 429, and finally seized the city, which he made capital of his new possessions. He then captured parts of Sicily, Sardinia and Corsica; in 455 he marched against Rome at the invitation of Eudoxia, the

widow of Valentinian, who was eager for revenge against Maximus, her husband's murderer. After two weeks of plunder he left the city with his soldiers, carrying off Eudoxia and her two daughters. At the date of his death he still was in possession of all his conquests.

GENTIAN, *jen'shan,* a flower found throughout America and Europe in moist woods and meadows. The species best known is the fringed gentian, which, through Bryant's poem *To the Fringed Gentian,* will live in the memory forever. It is also the flower which inspired Montgomery's *Gentianella* and Emily Dickinson's *The Fringed Gentian.* It appears in September and October, "when woods are bare and birds are flown," "an undisputed queen," growing from one to two feet high, dressed in long green leaves and fringed flowers of delicate misty blue. The blue gentian is the state flower of Wyoming.

Thou blossom! bright with autumn dew,
And colour'd with the heaven's own blue,
That openest when the quiet light
Succeeds the keen and frosty night.
—Bryant: *To the Fringed Gentian.*

In the illustration: (*a*) Fringed gentian; (*b*) bottle gentian; (*c*) solitary gentian; (*d*) downy gentian.

The common yellow gentian is found in the Alps and the Pyrenees, often growing in locations 3,000 to 6,000 feet above the sea. The Alpine peasants gather the yellowish-brown bitter root of this species and sell it for flavoring bitters and for use as a tonic and in diseases of the digestive organs. Large quantities of the root are imported into the United States and Canada.

Other species of gentian found in America are the *downy gentian,* with stem rough and hairy, the *solitary gentian,* each slender stem bearing but one large bell-shaped, light-blue flower, and the *closed* or *bottle gentian,* in which the flowers never open. The gentian is said to have been named after a king of Illyria.

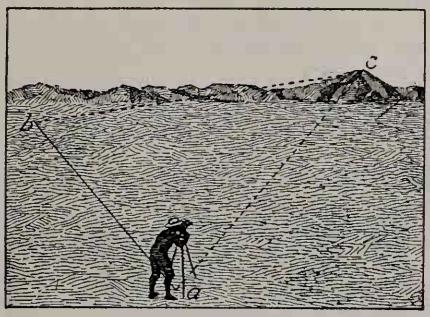
GENTILES, *jen'tylz,* in ancient times referred to all nations of the world other than the Jews, who, as the chosen people of God, considered themselves set apart for a special mission in the world. Their religion with all its truths was given to the Jews that they might be a light to the Gentiles, but, through the strict laws enacted to prevent them from becoming corrupted by association with idolaters, they soon felt contempt for the latter. Even the Christian Jews were offended when Peter, taught by the vision at Joppa, went to visit and eat with Cornelius, who was one of the hated race (*Acts* X, 28; XI, 3). However, the early Church consisted largely of Gentiles, who seemed more willing than the Jews to adopt Christianity. To-day the word has a broader meaning, for the Mormons consider as Gentiles all persons not of their faith. They include Jews in this designation.

GENUS, *je'nus.* This word, which means *kind,* is used in the biological sciences to indicate one step in classification. Animals or plants which have many characteristics in common, but do not resemble each other closely enough to be grouped as a species, may constitute a genus. The subject is more fully explained in the article Classification.

GEODESY, *je od'e si,* the science which treats of the shape, size and curvature of the earth. Geodesy is really a branch of surveying, by which great distances are measured and points on the earth's surface are located by a method of surveying called *triangulation.* It rests upon the principle in trigonometry that if one side and two angles of a triangle are known the other sides and angle can be computed.

Suppose scientists wished to determine the exact position of a distant mountain peak. They would first measure a base line *ab* (see illustration) on the most level tract of land in their locality, making it from five to ten miles long and measuring it several times to make sure that the distance is exact. Then they would set their surveying instrument (a theodolite) at *a* and point it to *c,* recording the

angle which the line from *a* to the summit made with *ab*. They would then take their instrument to *b* and measure in the same manner. From the length of *ab* and the angles at *a* and *b* they can readily find the length of the lines *ac* and *bc*. Again, using *ac* or *bc* for a base line, other points at various distances can be determined in like manner. The Coast and



Explanation in text.

Geodetic Survey of the United States is constantly engaged perfecting the survey of the United States, and other countries have corresponding organizations engaged in similar work. These have formed the International Geodetic Survey and are engaged upon a new map of the world, which cannot be completed before 1925. See COAST AND GEODETIC SURVEY.

GEOFFREY, *jef'ri,* **OF MONMOUTH** (about 1100 - about 1154), a Welsh historian, born at Monmouth. Little is known of his early life. He is supposed to have been a Benedictine monk, and later the bishop of Saint Asaph. The most important of his works is the *Historia Regum Britanniae* (History of the Kings of Britain); the work is said to be chiefly a translation of ancient Breton manuscripts, and gives what claims to be a history of the British kings from Brutus, the Trojan, down to 688. While it is of the greatest interest as the main foundation of the legends of *King Arthur and the Knights of the Round Table, Lear* and others, it is considered of little historic importance. Geoffrey also wrote a Latin translation of Merlin's prophecies.

GEOGRAPHICAL SOCIETIES, *je o graf'i kal so si'e tiz,* organizations devoted to obtaining and popularizing geographical knowledge. Their object is threefold; they seek to arouse in people a keener interest concerning the earth on which we live; to encourage travelers to explore regions about which little is known; and to spread this new knowledge among the general public by means of printed proceedings, and also, in most cases, by their magazines and by popular lectures by noted travelers. They assist explorers with money, supplies and practical instruction, and award medals and other honors to those who by their researches add something of value to the science of geography.

The oldest of such societies is that of France, founded in Paris in 1825. The most famous in Europe is the Royal Geographical Society of Great Britain, dating back to 1830. To this belonged Stanley and Livingstone, the great African explorers; Nansen and Markham, who voyaged in search of the North Pole, and many other travelers and scientists. The Royal Geographical Society is the active center of the exploration work carried on in the interests of the British Empire, and exploring parties under its auspices—in some cases supported by it—are at work in almost every part of the unknown world. The Danish Geographical Society, though not so well known, has accomplished much in the advancement of geographic knowledge. Similar societies exist in Germany, Russia, Scotland, Italy and other countries of Europe.

In the United States there are two large national organizations. The older is the American Geographical Society, organized in 1852, with headquarters in New York City; the second, the National Geographic Society, organized in 1888, with headquarters in Washington, D. C. The former association has been closely connected with American Arctic ex-

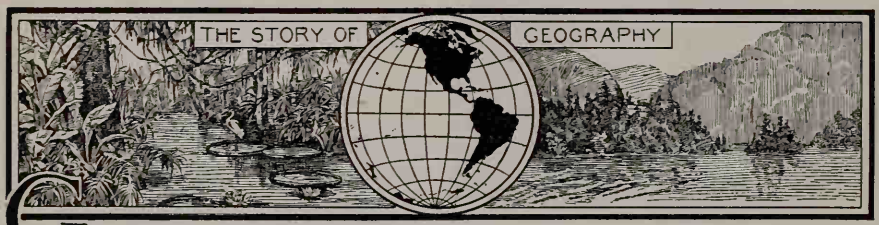
HOME OF NATIONAL GEOGRAPHIC SOCIETY

ploration and boasts as one of its past presidents, Robert E. Peary, the discoverer of the North Pole. Its proceedings are published in a journal called the *Bulletin*.

The National Geographic Society has the largest membership of any scientific society in the world—more than half a million—drawn

from all parts of the country, and does a splendid work in making geography popular through its annual lecture course and its widely-read publication, the *National Geographic Magazine*. The magazine makes a specialty of describing and illustrating by actual photographs not only newly-discovered territory, but any part of the world where interesting things are happening. This makes it extremely fascinating and helpful to boys and girls at school and to adults who desire to be well informed on timely topics. In tone and membership this society is much less technical than the American Geographical Society. Both organizations occupy fine buildings of their own and possess valuable collections of ancient and modern works on geographical subjects. (See illustration on preceding page.)

In some of the larger cities local geographical societies have been formed, those of Chicago, Baltimore and Philadelphia being particularly active and successful. The total number of such associations throughout the world is over a thousand. G.H.G.



GEOGRAPHY, *je og'ra fi,* is one of the most interesting of all the sciences, not only because it has so many phases, but because it touches human life at so many points. In fact, it may be called one of the few universal subjects. A man may live all his life without studying even such common subjects as spelling and grammar, for instance, but he cannot grow up without constant contact with geography. The tiny baby just learning to walk is accumulating geographic knowledge—learning which chairs are so far apart that an unaided journey between them is impossible; which tables are so placed that they offer aid to a little voyager who has set out on too long a journey. The older child learns more—where the corner candy-store is; where the fascinating ditch flows, down which toy fleets may be sailed; which side of the house has the pleasantest breeze on a hot summer afternoon. To be sure, the child does not think of all this as geography—he is simply fitting himself to his surroundings; but it is a type of the formal geography which he will study in school when he gets older.

What Geography Is. Writings about the earth—that is what geography really is; for *geo* comes from a Greek word meaning *earth,* and *graphy,* from the word *to write.* It takes but little account of what the earth was in the past, save as bygone conditions influence world facts to-day; it pays no attention to the manner in which life, whether plant or animal, came to be on the earth; it does not directly concern itself with the stars and the planets; yet it is closely related to geology, to biology and to astronomy, the sciences which make the topics mentioned above their special field, and to other sciences as well. It treats of the form of the earth, the distribution of water and land, the height of mountains and the depth of seas, the distribution of plants and animals, the qualities which fit or unfit a region to be the home of man, and the reasons, so far as may be known, why things are as they are on the earth's surface. The history of Greece, for instance, does not naturally seem to be a part of geography; but when it is understood that the history of Greece resulted largely from the geography of the little country; that a number of little independent states grew up rather than one large state because of the mountain barriers, then it may be seen how very closely the history and geography of some countries are connected. Indeed, one cannot fully understand the history of any country without a knowledge of its geography, for not only the economic development and the relation to other nations, but the national characteristics of the people, are influenced profoundly by conditions of soil, topography and climate.

It may thus be seen that geography is a very wide subject, with phases which are certain to delight any student. One student feels the romance of maps, those apparently simple

charts which make so plain to him all that has been learned about the earth through centuries of study and exploration; another reads with delight of foreign lands where customs and character are different from those of his own land; a third likes the economic phases—the study of the great industries which have grown up in different parts of the world because of varying geographic conditions; while a fourth finds especially interesting the story of the changes which wind and rain, cold and heat have worked in the surface of the earth upon which he lives. Geography tells some great story to everybody.

The Story of Geography

What the Ancients Thought of the World. Very wise were some of the ancient peoples on certain matters—so wise that in such subjects as art, literature and philosophy little advance has been made since their day; but in geographic knowledge they were woefully lacking. The small schoolboy of to-day, even the one who dislikes geography and thinks that the less he can learn of it the better, knows more about the subject than did Socrates or Plato, two of the wisest men the world has ever known.

In the first place, the ancient peoples believed, as do all primitive peoples to-day, that the earth was flat; that about it in all directions flowed a great sea, which was limited only by the canopy of the sky, bending downward to meet it. Each nation thought that its own territory lay just in the center of the earth, and many of them had legendary tales of islands which were situated far toward the sunrise or the sunset, in the uncharted seas. The seafaring Phoenicians were not content with such legendary knowledge, and pushed out into regions unknown before, bringing back to the Asiatic world real information about lands far to the westward (see PHOENICIA). Some authorities even declare that in the seventh century B.C. Phoenician navigators sailed around Africa.

The Greeks, with their young, inquiring minds—that marvelous people to whom the earth was all a wonder-world—were intensely interested in geography, and some of their wise men made very important contributions to the subject. It is a great mistake, for instance, to imagine that it was not until the days of Columbus that people knew that the earth was round, for before the time of Aristotle that fact had been conclusively established, and Aristotle himself figured the circumference of the earth at 40,000 miles. About 200 B.C. a Greek of Alexandria, Eratosthenes by name, made a far more accurate estimate, figuring out by means of measurements of the length of shadows thrown by the sun in different places that the earth was 25,000 miles around. Another Alexandrian, Ptolemy (which see), was an epoch-maker in the science of geography, discovering many principles which future study has in the main proved correct, and drawing a map of the known world which remained the standard authority for more than ten centuries.

The Age of Discovery. The people of the Middle Ages paid little attention to geography. The subject was too practical, too material, for this age, in which churchmen were the only scholars and the affairs of the Church the only subject in which they were interested. Incredible as it seems, the knowledge that the earth was a sphere was lost altogether, and the theory was developed that the earth was a flat surface, with Jerusalem as its exact center. A map of those old days is particularly fascinating. About Jerusalem as a center were spread out the known countries of the world—Persia, India, Arabia, Asia Minor, Greece, Italy, Africa; and even, far to the northwest, Great Britain. Mountains and rivers were rudely drawn, the Indian Ocean and the Mediterranean Sea wound their way between the shores, and all about the border were drawn the figures of the winds, each blowing with all his might, with distended cheeks. Shem, Ham and Japhet ornament three of the corners, and all down one side there are drawings of fabulous beings—six-handed men, centaurs, mermaids and men with necks like snakes. That map was made just about the time that Columbus started on his voyage, ushering in the modern age for the world.

Fortunately, however, Columbus did not look to such a map for guidance, but to the one made by Toscanelli according to Ptolemy's figures. There were mistakes in it, for its compiler had used the 40,000-mile estimate in making it, but this was a help rather than a hindrance to Columbus, for it made him think that the Indies, which he hoped to reach by sailing westward, were closer than they really were, and so gave him courage to set

out. It is unnecessary to give in detail all the results of that great era of exploration which began in the latter part of the fifteenth century. It is enough to say that the western hemisphere was discovered—the *New World,* as people called it in those days; that an all-water route around the south of Africa to India was discovered; and that the world was circumnavigated—the crowning achievement. Once the continents were actually known, exploration of their interiors was begun, and the outline of the American continent was put on the map of the world.

The Age of Exploration. There came a lull, when nations seemed to think more of acquiring territory and power than of acquiring knowledge; and not until the late eighteenth century did intense, driving curiosity waken again. As the late fifteenth and the sixteenth century constituted the age of discovery, so did the nineteenth century constitute the age of exploration. Not only in America but in the more dangerous wilds of Africa, of Australia and of Asia, this exploration went on, and there cannot be a correct appreciation of geography and of all that it tells without some knowledge of how this has been gained. A "dry study," children sometimes call it, and yet, back of its facts and its accurately-drawn maps there is the heroism of many men who risked and, all too frequently, lost their lives that the world might be made an open book to all who choose to read. Boys and girls who went to school in the middle of the nineteenth century, for instance, had in their geographies no such map of Africa as the textbooks of to-day show. The outline was there, but everything but the coastal region was left vague; it was called the "dark continent." Where were the sources of the great rivers that ran to the sea? What sort of peoples lived on their banks? Were there forests and mountains, or flat prairies, in the interior? What animals roamed these wilds? Nobody knew; but to-day all this information in definite form is the property of every schoolboy, because there was no lack of men who felt the romance of geography.

There were some discoveries, too, left for the nineteenth and the twentieth centuries—discoveries in the far regions about the poles. How explorers met the challenge of these ice-bound lands and seas may be learned from the article on POLAR EXPLORATION.

The Change in Geography. It might seem that, when the discoveries were made and charted on the maps, when the descriptions were written and the statistics were gathered, the work of the geographer was done; but this is not true. The gathering of such facts, apparently unrelated for the most part, was the main province of geography for centuries, but the new geography concerns itself rather with organizing these facts in accordance with certain governing principles—in other words, the new geography is a *science* in the true sense of the word. The gathering of a multitude of facts has shown that there are undoubtedly fundamental laws upon which similarities and variations rest, and the geographer exerts himself to find out these laws.

It cannot be mere chance, for instance, that all the world's greatest and most progressive nations have grown up in the temperate zone. Are the conditions which have resulted in this unchangeable? Is it hopeless ever to attempt to build up a civilization of the modern type in tropic countries where lavish nature seems able to produce everything except energy, or to populate regions of excessive cold? Can men go on for generation after generation adapting themselves to geographic surroundings, and the surroundings to themselves, without in time acquiring the characteristics of the original inhabitants of the region? Many and interesting are the problems related to human life which the geographer is called upon to solve, and it is the scientific point of view from which such questions are studied that distinguishes the new geography. J.R.

Divisions of Geography

So wide a subject as geography must of necessity be broken up into various divisions, and the most commonly accepted classification divides it into *mathematical* geography, *physical* geography, and *biogeography.* This last named division, of which the name at first appears somewhat difficult, is merely "life geography," or political geography.

Mathematical Geography. In a way, this lies at the basis of all the other phases of the subject. It treats of the shape of the earth (which is not a simple sphere, but an irregular *spheroid,* flattened at the poles, for want of a better name called *geoid*), of its size and its movements. At first thought it might seem that this is a very abstract division of geog-

raphy, having nothing much to do with the life of man on the earth; but what has a greater influence on man and his activities than the changing seasons, and do not these depend entirely on the movements of the earth among the planets? Mathematical geography is closely related to astronomy, for only by astronomical means can vast measurements be made or such complicated movements calculated. Only the simpler elements of mathematical geography are necessary to the ordinary student of the subject—only such as will give him an appreciation of distances on the earth's surface, of latitude and longitude, of the inclination of the earth which determines the various zones, and of the relation of time to longitude.

The Useful Map. One of the very important branches of mathematical geography is map-making, or, as it is more technically called, *cartography*. What is a map? It is not a picture, for the lines upon a map do not resemble very closely the objects which they represent. Time was, in the old days of map-making, when attempts were made actually to picture conditions. Rows of little hills, as accurately drawn as might be, showed where the mountains ran; a group of buildings represented a city; trees were sketched to show forest land, and even animals were shown in the wild regions. But to-day the map-maker does not need artistic skill of just this sort, for there has been an agreement as to certain symbols which shall represent certain facts. A map, then, is a *representation,* and not a picture, and it may show the entire surface of the earth or any part of it.

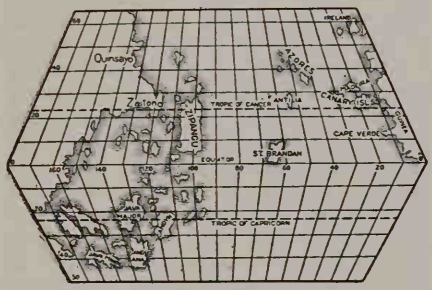
A child, asked as to what a map can show him, finds no difficulty in his reply. It shows the difference between land and sea, distinguishes one country from another, shows rivers, mountains, lakes, cities, which city is the capital of a country, and, sometimes, the relative size of cities. These are, indeed, the main things which the commonest type of map shows, but there are coming more and more into use maps which show other things. Particularly well known are the maps which show by shading the varying elevations above sea level; relief maps, they are called. Then there are those which show railroads and roads, those which show mineral productions, vegetable or animal life, or industries. Even the regions in which the various religions prevail are shown on maps. In fact, there are few great facts about the world and its inhabitants which cannot be shown more strikingly by means of maps than in any other way. No one who has ever studied maps carefully can fail to realize their appeal. There is the delight of finding the familiar home city, of tracing the course of the river which is but a little trout stream as it flows by the home farm but swells later to a mighty river, of seeing in graphic form the relative elevation of the everyday surroundings; and then there is the equally great pleasure of picking out the far-away cities whose names have always had a particular charm, of marking the course of the rivers whose names have been sounded for centuries in literature, of finding the part of the world in which great events are taking place to-day. Who, on taking a journey across the North American continent, has not felt the need of a map that he might know when he passed from one state or province to another, what river it was that ran beside the train for hours, or where the lines ran that marked the change from one system of time to another?

These things make up the romance of maps, but there is a very practical and laborious side to them. The child who draws in school a map of Illinois or of Alberta, who carefully sketches the continents, beginning with Africa or South America and coming by degrees to the intricacies of the European or North American coast line, thinks that he has "made a map"; but it is one thing thus to draw with the eyes on something which has been already perfected and an entirely different thing to work out a satisfactory method of plotting such maps in the first place.

For the earth is round and most maps are flat; therein lies the great difficulty. Slit the skin of an orange straight around, letting the cut pass through the ends or "poles," and remove it in two parts. These two hollow hemispheres may well represent the two hemispheres of the earth, or rather, their surface. Can these be flattened out on the table without further cutting? Obviously not; and it is just as impossible to represent the surface of the earth accurately on a flat surface. With a sharp knife cut down from the "poles" toward the center, or "equator," of the orange skin, taking care not to sever the hemisphere entirely. When a number of slits have been made, the skin may be laid approximately flat on the table, but while the "equator" remains just as it was at first, toward the "poles" there has been considerable spreading.

Now suppose there had been drawn on this orange skin, as on a little globe, a map—perhaps the map of North and South America. What would be the result as regarded the northern part of North America, the widest land area? The western point of Alaska and the eastern point of Labrador would be much farther apart than they were on the original orange skin, and there would be many "gaps" in the map. In making maps compromises are necessary in meeting this difficulty, and no flat map can ever represent accurately any very large part of the earth's surface. On an ordinary map of the world, for instance, where the degrees of longitude are shown as just as wide at the pole as at the equator, the land masses are all "top-heavy" toward the poles, appearing far wider there than they really are.

The subject of *projections,* or the devices resorted to with the object of lessening these errors, is too technical for such an article as



MERCATOR'S PROJECTION

this. Best known is *Mercator's projection,* which is useful for sailors' charts, but which by no means avoids the difficulties of map-distortion.

Map-Making in School. Such map-making as is referred to above—the free-hand sketching of continents, countries, states or provinces—is useful because it impresses upon a child's mind outlines and, if carefully done, comparative areas; and the value of such an exercise may be increased by the addition of rivers, mountains and cities. But this is by no means the most valuable sort of map-making for a child. He can obtain a far better idea of the principles of map-construction by charting his familiar environments. The earliest attempts should be simple—perhaps he may map out the schoolroom, with straight lines to represent the rows of desks, a square for the teacher's table, and a circle for the heater. But his map should be drawn to scale; that is, measurements should be made, and a scale of drawing decided upon. If the room is thirty feet by twenty feet, and the map is to be drawn upon a scale of five feet to one inch, the map will be six inches by four inches. Later the child may draw a map of the school yard or of his own yard, or perhaps even of the block in which he lives, but unless the idea of scale is kept in mind, no real gain is made. Of course such maps of limited areas do not give the pupil any idea of the difficulty of charting the "great round world," but they do show him many other things, such as the need for accuracy in measuring and the importance of scale.

Physical Geography. This second great division of geography, very commonly known as *physiography,* ignores every living thing, and treats of the earth's appearance and the changes which have been wrought and are being wrought to-day in its surface. The three "spheres" of the earth's surface which it considers are the land, the sea and the air, and it may be seen at once that these offer a basis for a very wide science. Were the continents always where they stand to-day? Is "as old as the hills" a just expression, or are there young hills? Why are some mountains smooth and rounded and some rough and craggy? Why are some rivers broad and sluggish and others narrow, dashing torrents? How deep is the sea? What makes the tides? Why does it hail in hot weather but never snow? What determines the direction of wind? All these and a thousand other questions, many of them so interesting that if a man has once put them to himself he cannot be content until they are answered, physical geography will explain. Though it does not deal with living things, it is a very "human" science, nevertheless, for it treats of the conditions under which living things exist. A more detailed discussion of the subject is given under the heading Physical Geography.

Biogeography. It is life, whether plant, animal or human, which is most interesting, and this last phase of geography is one of the broadest and most fascinating. To understand it thoroughly there must be a knowledge of mathematical and physical geography, for this "life geography" is mainly a study of the manner in which the form, motions, climate and the surface features of the earth affect living things.

Plant Geography. Anyone who has traveled to any extent has had his attention attracted

by the variations in the forms of plant life in different localities. In Canada there are vast forests of cone-bearers—pines, firs, spruces and hemlock; in the Eastern United States there are woods of beech and chestnut and oak; in Florida there are those gloomy, mysterious but beautiful swamps, the Everglades, while the western part of the continent has here and there great stretches where sage, cactus, yucca and similar plants grow. Sometimes one finds sharp contrasts. Thus, in the American continent, a high mountain range separates fierce deserts on the one side from a large part in determining all these crops, and the geographer must pay attention to soils as well. When it is considered that directly or indirectly, every form of animal life on the globe, including man, is dependent upon plants for its very life, the importance of such study of plant geography is evident (see PLANT).

Animal Geography. Animals are not so completely dependent upon conditions of temperature and moisture as are plants. If surroundings become too unpleasant and unfavorable, they can migrate, and, within reason, adapt themselves to a different environment. Never-

BEHAIM'S MAP OF THE WORLD

Prepared about the year 1490. The American continents were not known to exist, and it was believed the way was open straight across the trackless sea to the continent of Asia.

fertile and productive lands on the other. In the tropical rain belt pour down the rains that make Central Africa an almost impenetrable jungle, flanked on both sides by inhospitable deserts. Now the geographer does not content himself with saying, "There are deserts where there is no water, and rich plant growths where rainfall is abundant;" he goes back of that and works out the causes which govern the scanty or the plentiful rainfall.

Nor is it climate only with which he concerns himself. It is not merely because of temperature and rainfall that the Canadian Northwest is a wonderful wheat-growing country; that Iowa produces great quantities of corn; that Florida grows grapefruit and that Italy is famous for its grapes. The soil plays

theless, there are distinct climatic zones of animal life as well as of plant life, and the animals of the Arctic regions differ as decidedly from those of the tropics as do the plants of the two sections. One may go to a zoölogical garden and see polar bears, lions, monkeys, Arctic foxes and elephants in adjoining cages, but they are not thus closely associated in their natural homes. Time was when many of the animal forms were far more widely distributed than they are at present, but changing climatic conditions led to repeated migrations and to the existing distributions. Here again, however, as with the plants, it is not climate alone which has been the determining influence. South America and Africa, for instance, are both equatorial continents, but they

are so widely separated that the animals of one continent apparently have never been able to migrate from the one to the other, at least in recent times. Nevertheless, there seems to be a very marked similarity between many species common to both. The monkeys, lizard species (alligators and crocodiles), antelopes and animals of the cat kind (leopards and jaguars) do not differ very materially. The ostrich of Africa is represented by the rhea in South America; and the species from which have descended the animals of the llama kind in South America are thought to be progenitors of the species from which the camel is descended. Such similarities are observed also in North America and Europe, which have many species both of animal life and plant life in common.

One of the most interesting phases of this animal geography is the subject of migrations, whether of birds or of animals. See BIRD, subtitle *Migration of Birds;* ANIMAL, subtitle *Migration of Animals.*

Human Geography. In a sense, all the other branches of geography may be considered as leading up to the study of man and his environment, which is so important and has so many divisions that it practically constitutes a science in itself. *Anthropogeography* it is called, but that apparently difficult word simply means the *geography of man.* There may be no hemlock trees in the desert, no lions at the North Pole, no sagebrush in the rich bottom lands of a river, but there are men almost everywhere, for man is the most adaptable of all living things. It may seem that a desert stretch is too dry to support life; that a swampy region is too unhealthful to be safe; that a mountain range is too steep ever to be accessible; but if once man's ambition is aroused he leads rivers to the arid land, drains the malarial swamp, and scales the lofty mountain to establish railroads or to sink his mines into its depths. He can face cold or heat, moisture or drought, but he does not thrive equally everywhere, and in consequence all parts of the earth are not evenly populated. The frigid zones furnish but a scanty living; the tropics take from man his ambitions and his desire to work and leave him lazy and content merely to exist; and it is therefore the temperate zones that people have most thickly settled. Man and the camel are the only animals that, unaided, can cross a desert. The one is educated or trained to overcome the conditions of his environment; that is, he "knows how;" the other is physiologically formed for desert life; he is "built that way."

Then there are the different races of men—the black, the red, the brown, the yellow and the white. Is there any special cause for the differences that exist among them? Is there any reason why they live as they do—why the Caucasian race did not originate in Africa and the negro in Europe? See RACES OF MEN.

The subject of occupations, too, is fascinating. Is the principal occupation of a people determined by their character, the geographer asks himself, or does it determine that character? He finds, on careful study, that the two react on each other. Living conditions largely determine occupation, and if a country evolves naturally, there is a regular sequence of activities. First, when settlers are few and land is plenty, herding is likely to be the common pursuit, for each man may have a large acreage on which his stock may graze. But as more people are attracted to the region, each man's holdings become smaller and farming takes the place of pastoral pursuits, for not nearly so much land is necessary for agriculture as for stock-raising. The time comes, however, when the people become so closely crowded together that the soil cannot support them all, and manufacturing and commerce partly take the place of agriculture. There are, however, other determining factors, particularly climate, topography and mineral content. Temperature and rainfall mark the boundaries of the cotton belt; the inclination of the earth's axis fixes the limits of the corn belt; glacial drift determines the loci of the best wheat lands; coal and water power control the area of manufactures; and harbors and easy trade routes very largely govern commerce.

Political Geography. Natural conditions, climate, soil, mountains, seas, do not determine all of geography, for a part of it is man-made. Is there any reason, so far as physical features affect them, why the United States and Canada should be separated just where they are? Would not a far more natural dividing line between two possible countries have been the Rocky Mountains, that great barrier which people hesitated to cross for long years after the eastern part of the continent was settled? The branch of geography which deals with the social activities of the human race, with human governments, with the size and boundaries of countries and with the location of cities, is called *political* geography. Very often geographic conditions show the closest con-

nection with political. It is natural, for instance, that Great Britain, separated from the mainland of Europe, should have developed as a distinct country, or that Italy or Spain, jutting peninsulas with high mountains between them and the continental mass, should have an equally distinct existence. But in Central Europe, the various states of Germany had in many cases purely arbitrary boundaries, and it is not strange that there should have been constant friction, each state trying to widen its borders at the expense of others.

Economic, or Commercial, Geography. This is, in a sense, a part of political geography, since it is man-made, but it has been given special study and is usually considered as a distinct branch. It treats of the industries of the world; of agriculture, and the reasons for its variations in different parts of the world; of raw materials and the principles which govern their manufacture into finished products; of mineral resources and why they are made the most of in some regions but neglected in others; of trade routes and transportation facilities, and the great part which commerce plays in the modern world.

The industrial and commercial phases have had a particularly close connection with political geography, in that they have determined so largely the location of cities. There was a time when the site for a city was chosen because it was easily defended, but to-day that question is seldom considered. The cities of Massachusetts are where they are chiefly because of the falls in the rivers, which furnish water power; London is the world's metropolis because it commands one of the most important trade-routes in the world; and Duluth owes its growth to the fact that the iron which is mined not far from it is easily shipped from there by way of the Great Lakes. Such instances might be multiplied indefinitely. J.R.

Interesting Ways of Studying Geography

"Home" Geography. There was a time, not so very many years ago, when a child beginning the study of geography took up one continent and then another, devoting about the same amount of time to each. He studied about the surface features, about the rivers, the people and the industries, spending comparatively little time on industrial subjects. More time was devoted to his own country, perhaps, than to any other, but his own state received no special attention and as for his home city or town and the activities that went on there, there was little or nothing said of them. In this day all that is changed. Teachers realize that in geography as in other subjects the pupil learns best if he proceeds from familiar things to those unknown, studying contrasts and similarities. Every little hill, every stream, every group of plants which the child sees on his way to school may be made to do its part in helping him to picture the mountains, the rivers, the forests or the prairies which he will find described in his textbooks. If he has ever watched the little sand flats deposited by a sluggishly flowing brook or ditch, he will have no difficulty in understanding the formation of the deltas of the largest river.

When one considers industrial phases, the value of home study is even more marked. If the town has some one dominant industry, it may be made clear to pupils why that instead of some other industry has grown up there. Perhaps it is a flour-manufacturing town, because the wheat fields are not far away; perhaps the irrigated land about the town grows excellent beets, and beet sugar factories are numerous; perhaps there are no manufactures but the trade is large because the region round about is productive, and a lake, a river or a great railroad makes transportation easy. It is far more worth while for a child to realize that geography has a determining influence on industries, and to understand in detail such industries as are available for study than for him to be able to recite glibly the "principal products" of a list of foreign cities.

Study by Comparison. Having become familiar with his own town and his own state or province—and in some localities an entire year is devoted to the study of just that much of geography—the student, whether he be a pupil in school or someone who has taken up the study outside of school, is ready to proceed to gain an idea of wider areas; and to a dweller in Canada or the United States the "wider area" represented by his own country is very wide indeed. Yet too few actually realize the vast size of their home country. They may be able to recite mechanically statistics as to its area and population, but these make little appeal to their imagination. There is the inhabitant of British Columbia, for in-

stance; does he know that his province, which is only one-tenth of the Dominion, would contain three times over the islands of the United Kingdom, that nucleus of the greatest empire in the world? Does the dweller in the so-called "Middle Western" section of the United States, in Illinois for example, realize that he is really an Easterner, since the geographical center of the country is in Kansas? Does it enter his mind that, possibly, his own state, with two others of almost equal size and fully equal resources, like Iowa and Ohio, could be placed in the state of California and that there would still be room to spare? The comparisons of this sort which can be worked out merely with the aid of a table of statistics are innumerable.

The articles in these volumes on the various states and provinces contain statistics as to area and population. With these as a basis, answer the following questions:

How does your state or province rank among the divisions of the country as to area?

How does it rank as to population?

How many states or provinces have a larger number of people to the square mile?

Has the largest state or province the greatest number of inhabitants?

If the population of the largest state or province were transferred to the smallest, what would be the density per square mile? If the population of the smallest were transferred to the largest?

Which state or province has the greatest railway mileage?

Which has the greatest in proportion to area? In proportion to population?

If the most sparsely populated state or province were as thickly settled as the most densely, how many inhabitants would it have?

If this process were reversed, what would be the population of the one which at present has the greatest density?

Is the density of population of your state or province greater or less than that of the country as a whole?

A Wider View. After gaining an idea of the home country it will be interesting to bring into the comparison other countries, and such a chart as the following will prove very helpful in reaching an understanding as to comparative areas, populations and other topics. Canada and the United States or one province and one state may be compared; it is possible to vary the combinations widely. In making your study, substitute your own province or state for the one here given:

DIVISION	AREA IN SQUARE MILES	POPULATION IN ROUND NUMBERS	POPULATION PER SQUARE MILE	RAILROAD MILEAGE
Canada	3,745,574	7,200,000	2	29,330
United States	3,000,000	92,000,000	31	244,000
Ontario	407,262	2,525,000	6	9,000
Illinois	57,000	6,000,000	105	12,200

Boundary Lines. Another interesting topic concerns the boundary lines of political divisions, whether countries or the minor divisions known as states and provinces. In very many cases, as stated above, these have been purely arbitrary, for this is the man-made phase of geography; but often physical conditions have had a strong determining influence, and it is interesting in the study of history to bear this subject in mind—to see whether countries shut in by natural barriers have had any less difficulty in holding their frontiers against enemies. Here, too, questions are perhaps more suggestive and illuminating than a discussion, but these are to be answered with the aid of maps and not of charts:

Are the continents political or physical divisions?

Which continent is most completely isolated? Which are the least isolated?

Are there any continents so closely connected that they might almost be classed as one land mass? Is the boundary between them to any extent arbitrary?

Are North America and Central America separated by natural or by arbitrary boundary lines? Central America and South America?

How many countries of Europe have arbitrary boundary lines?

Would it have been reasonable to have placed the boundary between France and Spain at the Ebro River? Why?

Is there any apparent physical reason why Belgium and the Netherlands could not have been one nation? Germany and Austria-Hungary?

Is there any more reason why Russia should own Siberia than England, for example?

What other country has had the same advantage as Great Britain in building up a strong empire, reasonably safe from invasion?

Turning to Canada and the United States, locate several natural boundary lines between Canadian provinces. Locate twenty between the states of the Union.

Can you find instances where natural boundary lines might have been used, but arbitrary ones were chosen instead? Do you know the reason why, in any of these cases, the natural boundaries were rejected?

If, in the days of exploration and settlement, one nation had colonized the eastern coast of North America, another the western, would it have been possible for two nations to develop

within the present borders of the United States? Where would the most natural boundary have been?

The "Human Interest" Side. Any student, whether man or boy, is naturally more interested in human beings than in things, and in recent years more and more recognition is being given to this fact. No longer is the seeker after geographic knowledge made to fill his brain with the "topographic features" of every country he studies until any interest he may actually have felt in that portion of the world has died. If there are rugged mountains, broad valleys, marshy coast land, he learns about them, it is true, but they are related in some way to the life of the people. The mountains, perhaps, though barren and inhospitable, contain stores of gold, and have thus played a large part in the history of the country by attracting many people; the broad valleys are the most thickly-settled parts of the country, it may be, while the swampy land supports its hordes of people, too, by furnishing just the right sort of land for rice-growing.

The people—their characteristics, their customs, their occupations, their needs—constitute the central factor in geography as it is studied to-day, and very interesting is the study of the connection between geography and people. The articles in these volumes on the various countries of the world lay especial emphasis on the people. So far as may be, if the inhabitants are enough alike to make possible any general statements, their physical and mental characteristics are sketched, and some attention is given to their modes of dressing and of living. In many instances, too, the articles are supplemented with pictures which tell more clearly than any description their story of the home life of the people. The way the women of Burma dress, the method of travel in China, the mode of life in an African village—these are but a few of the many stories the illustrations have to tell. J.R.

Study by Outlines. Another modern tendency which is too valuable to be a mere passing fad is toward the use of outlines. Too often children acquire information in the most illogical and jumbled manner; the ideas which they gain are correct, to be sure, but have no apparent relation to other ideas, equally correct, which are stored in other pigeon-holes of their brain. Study according to an outline does away with much of this danger, and makes the lessons not only more interesting but easier to remember. These volumes contain a great number of helpful outlines on geographic subjects. The articles CITY, PROVINCE and STATE have general outlines which may be applied to the study of any city, province or state, while each continent, each important country and a number of the great cities have detailed outlines fitted for specific study. Questions accompany most of these outlines.

Consult Redway's *Commercial Geography*; Gregg and Kirby's *The World by the Fireside*; Lyde's *Man and His Markets*; Carpenter's *How the World is Fed, How the World is Clothed, How the World is Housed* (three small volumes); Rocheleau's *Geography of Commerce and Industry*.

Related Subjects. In these volumes there are thousands of articles on geographical topics, and no attempt has been made to index them all here. They are all, however, readily accessible if the lists of related topics under many of the following articles be consulted. Under the article EUROPE, for example, are listed all the political divisions of the continent, such as *France*, and under each of these, in turn, are indexed the cities, rivers, mountains and other geographic features. Each *state* and *province* likewise has its own list of related topics.

MATHEMATICAL GEOGRAPHY

Aclinic Line
Antarctic Circle
Arctic Circle
Axis
Chart
Day
Degree
Equator
Globe
Hemisphere
International Date Line
Latitude
Longitude
Longitude and Time
Map
Meridian
Minute
Month
Pole
Seasons
Sidereal Time
Standard Time
Time
Tropics
Year
Zone

PHYSICAL GEOGRAPHY

Air
Alluvium
Atoll
Avalanche
Basin
Blizzard
Bore
Calms, Regions of
Canyon
Cave
Chaparral
Chinook
Climate
Cloud
Coastal Plain
Cyclone
Delta
Desert
Dew
Divide
Doldrums
Dust, Atmospheric
Dune
Earth
Earth Currents
Earthquake
Equinox
Erosion
Ether
Fall Line
Fiord
Flood
Flood Plain
Fog
Frost
Geyser
Glacier
Gulf Stream
Hail
Harvest Moon
Haze
Hill
Horizon
Horse Latitudes
Humidity
Hurricane
Hydrography
Icebergs

Island
Isobars
Isothermal Lines
Isthmus
Japan Current
Khamsin
Labrador Current
Lagoon
Lake
Land and Sea Breezes
Lava
Levant
Lightning
Maelstrom
Marsh
Mesa
Meteorology
Mirage
Monsoon
Mountain
Natural Bridge
Norther
Oasis
Ocean
Ocean Currents
Oceanography
Physical Geography
Plain
Plateau
Prairie
Prevailing Westerlies
Quicksand
Rain
Rainbow
River
Saint Elmo's Fire
Savanna
Simoom
Sirocco
Sky
Snow
Snow Line
Spring
Stalactite and Stalagmite
Storms
Talus
Terrace
Thermal Springs
Tides
Tornado
Trade Winds
Tundra
Twilight
Typhoon
Valley
Volcano
Waterfall
Watershed
Waterspout
Waves
Whirlpool
Whirlwind
Wind

ISLANDS

See list, in article *Island.*

LAKES

See list, in article *Lake.*

MOUNTAINS

See list, in article *Mountain.*

OCEANS

See list, in article *Ocean.*

RIVERS

See list, in article *River.*

SEAS, GULFS AND BAYS

Adriatic Sea
Aegean Sea
Arabian Sea
Azov, Sea of
Baffin Land and Baffin Bay
Baltic Sea
Bengal, Bay of
Bering Sea
Biscay
Black Sea
Bothnia, Gulf of
California, Gulf of
Caribbean Sea
Caspian Sea
Cattegat
Chesapeake Bay
China Sea
Darien
Dead Sea
Delagoa Bay
Delaware Bay
English Channel
Finland
Florida, Gulf of
Fundy, Bay of
Galilee
Georgian Bay
Guinea, Gulf of
Hudson Bay
Indian Ocean
Ionian Sea
Irish Sea
James Bay
Long Island Sound
Marmora, Sea of
Mediterranean Sea
Mexico, Gulf of
Minas Bay
Narragansett Bay
North Sea
Okhotsk, Sea of
Persian Gulf
Puget Sound
Red Sea
Riga, Gulf of
Saint Lawrence, Gulf of
Skagerrak
Solway Firth
White Sea
Yellow Sea
Zuider Zee

MISCELLANEOUS

Africa
America
Antarctic Lands and Seas
Arctic Lands and Seas
Asia
Australia
Central America
City
Europe
North America
Province
South America
State

GEOLOGICAL SURVEYS, *je o loj' i kal sur vaze',* though maintained by the governments of the United States and Canada at an annual expense of hundreds of thousands of dollars, are said to be worth many times as much to the two countries. Organized primarily to aid geologists in their study of the past and present structure of the land, they also assist in the development of mineral resources by furnishing to the public reliable information about the location of various deposits. The topographical divisions prepare accurate maps of the country which are the basis of all commercial maps, and are so full of detail that they save much of the preliminary survey work usually necessary for railroads, canals, aqueducts, dams and reservoirs. In the United States the Survey has the additional duty of investigating favorable regions for irrigation systems and choosing the location for dams and reservoirs in connection with them.

The United States Survey is preparing a huge map of the whole country which will display the contour of each section, and show the villages and cities, roads, railroads and other artificial features in great detail. The map is published in sheets, each sheet representing an area contained within one degree of latitude and one of longitude. The scale varies from 1:25000 (which is about one inch to four miles) for desert regions to 1:62500 for districts thickly settled. A similar undertaking in Canada was commenced only a few years ago, and a few maps have been published, mostly of British Columbia areas.

The geological survey of Canada is older than that of the United States, having been established in 1842. Its most famous director was Dr. George M. Dawson, whose biography appears elsewhere in this work, and for whom Dawson City, in the Klondike gold region, was named. The United States Survey was formed in 1879 as a consolidation of several independent surveys which had been operating in the West. Its organization was largely due to John W. Powell, the explorer of the Grand Canyon of the Colorado River.

GEOLOGY, *je ol' o ji,* the story of the earth from its beginning through the millions of years or ages that no man can number, down to the present time.

The Story of a Shell. One spring day Tom brought his teacher a piece of rock in which there was a shell almost exactly like shells that he had found on the seashore when he was in Florida. The shell had turned to stone but its form had not been changed; even the smallest markings on it could be distinctly seen. Tom lived in a state far from the sea; moreover, he had broken this fragment of rock from a ledge on a high hill, and he said that the ledge was full of these shells. The first question he naturally asked was, "How did these shells get where I found them?"

Since all the pupils were interested in the question, the teacher told them he would help them to answer it, by showing them how to read the oldest, the largest and most peculiar book that man knows anything about, the book of the earth.

The Old Book. We usually think of the Bible as the oldest book, and so it is if we consider only books with paper leaves on which words have been printed; but the book which this wise teacher taught his pupils to read so they could answer Tom's question was made long before there were any men to read it. It is *The Earth,* truly a huge and heavy volume. The rocks are its leaves, and the fossils of the past ages, together with the plants and animals of the present time, are its letters and figures. The leaves are sometimes misplaced and now and then we find that one has been torn out, so in some places the record is not complete. But it is a wonderful story.

This book contains the history of the earth from its beginning to the present time. It tells us something about how the earth was formed, of the different changes it has undergone, the different kinds of rocks in its crust and of the many strange plants and animals that lived in the long, long ago. The story this book tells the scientists call *Geology,* for *Gea* was the old mythological name for the earth, but Tom's teacher called it *The Story of the Earth;* both mean the same thing to us. We shall read this story more easily if we begin at the present time; from observing the forces now at work changing the surface of the earth we can gain an understanding of how these same forces worked in the past ages.

The Three Spheres

Earth, Air and Water. The ancients believed that there were four substances from which all things were created; these were earth, air, fire and water. We have long since learned that fire is not a substance, but we know that the other three form the earth. The geologists consider these three substances as three spheres—the atmosphere (air sphere), the hydrosphere (water sphere), and the lithosphere (rock sphere).

The Atmosphere. We live at the bottom of a great ocean of air which extends upward to an unknown height—possibly 200 miles. At sea level it presses down upon us with the force of almost fifteen pounds to the square inch, and were this pressure materially changed we should become very uncomfortable. The pressure decreases as one rises to heights above sea level; the density is so much less even four miles upward that few people can survive an ascent of that distance. The air is composed of numerous substances mixed together; the most important of these are oxygen, nitrogen, carbonic acid gas and water vapor (see AIR). The atmosphere is and always has been an important agent in changing the surface of the solid parts of the earth. It does this chiefly through weathering, winds and rainfall.

Weathering. The atmosphere covers the earth like a mantle. By absorbing the heat of the sun's rays and reducing their intensity it shields the land and water from the intense heat which would otherwise fall upon them. It also prevents the absorbed heat from escaping into space when the sun is not shining. Thus the atmosphere is the great equalizer of

temperature, and were it not for its influence the burning heat of the day would be followed by intense cold at night. Nevertheless, there is sufficient change in temperature to cause freezing and thawing over large portions of the earth, and these changes in temperature cause the surface of the rock to break into fine particles, or, as the scientists put it, to *disintegrate*.

Again, some of the gases in the atmosphere combine with the rocks and form new compounds which, because they are not as hard as the original rock, soon crumble. The fine particles of rock and soil found on and around large rocks and at the foot of cliffs are formed chiefly by this quiet work of the atmosphere, which is known as *weathering*.

Wind. The atmosphere is constantly in motion, and currents of air, like currents of water, carry along more or less solid matter. An ordinary wind will move fine sand and a strong wind will move gravel; consequently, over some portions of the earth winds are constantly changing its surface. These changes are most striking in sandy regions, like Dune Park, Indiana, on Lake Michigan, where the sand is drifted like snow, and in desert lands, where the surface is very dry. In other regions the constant hurling of these particles of sand and dust against the rocks gradually wears them away and carves them into fantastic forms, as in Monument Park, Colorado. Moreover, however clear the air may appear to us, it always contains dust, and this dust is so fine that even the slightest current moves it. The particles of dust are so small and this movement is so gentle that we do not perceive them, but geologists estimate that this movement going on through all the ages since the earth was formed has caused marked changes on its surface.

Rainfall. The amount of water vapor in the atmosphere depends upon the temperature. The warmer the air becomes the more water it can contain. When the temperature is lowered sufficiently, the air becomes *saturated* with moisture, and as no more can be held some of the vapor falls in the form of rain or snow (see RAIN; SNOW). Some of the rain soaks into the ground and some runs down the slopes into the streams, carrying more or less soil with it. This soil is carried to the lower levels of the streams and there deposited as *silt*. Thus rainfall is an important agency in wearing down the higher and building up the lower levels.

The Hydrosphere. The hydrosphere, or water sphere, includes the water in the ocean and on the land. These different bodies of water are described in these volumes under their titles, as LAKE; RIVER; SPRING; OCEAN. Our purpose here is to show how they are causing changes on the earth's surface.

The Ocean. The ocean covers about three-fourths of the earth's surface, but owing to the position of the continents it is irregularly distributed and is gathered in a series of great basins. We are here especially interested in the action of the ocean in changing the surface of the land; for other particulars, see OCEAN.

Waves raised by wind and tides wear away the rock in many places, and deposit the sediment on the beach and on the bed of the ocean. In many places waves strike the coast with great force and they often wear caves in the rocks, or cut them into curious forms. They are one of the most powerful agents in wearing away the coasts of the continents.

While ocean currents move so gently that they do not affect the form of the coast line, they exert a great influence on climate, including rainfall, and in this way indirectly cause changes on the land. The ocean contains many plants and animals. When these die they settle to the bottom, and in this way the bed of the ocean is being constantly though very slowly raised. However, this change is so slight that in considering the story of the earth we need give no heed to its present influence.

Water. The effect of running water is described in the article EROSION. Lakes on a small scale cause the same changes that the ocean does on a large scale. Mineral springs often form solid deposits which are of interest because they show how some rocks have been formed in the past. These formations are so small that they are scarcely worthy of consideration when studying the changes on the earth's surface as a whole. Ice and snow are ever wearing down the mountains and filling up the valleys. See GLACIER.

There is another way also in which water is working changes and which we seldom consider because it is out of sight. Whence comes the water that bubbles up in springs, fills our wells and feeds the thirsty plants? It comes from the ground, and is generally known as *ground water*. The quantity of ground water in a given locality is largely dependent on the rainfall. The height to which it rises, that is,

the distance below the surface at which it may be found, is the *water table*. In a dry season the water table is lowered, while in a wet season it is raised. Ground water holds various sorts of plant food and other substances in solution. It is the chief source of nourishment for plants, and it also aids in the decomposition of rocks. It is, therefore, one of the agents whose work we need to remember when considering the changes now taking place on the earth.

The Lithosphere. The lithosphere, or rock sphere, includes the solid portion of the earth; this is about eight-ninths its *mass*, by which term, however, we do not mean its *thickness*. Geologists usually speak of it as the earth's *crust*. As the story progresses we shall find that geology is closely related to other sciences, especially astronomy, botany, zoölogy, chemistry and physics. Its subject-matter overlaps that of physiography at many points, and here the article PHYSIOGRAPHY should be referred to.

Reading the Rocks

Specimens. Tom's question about the shell and the teacher's method of answering it awakened a lively interest in rocks, and the teacher's desk was soon covered with specimens brought in by the pupils. Nearly all these specimens were gathered in the locality, yet some showed marked differences in color and structure. Some contained shells like Tom's; others contained shells of a different kind; in others were found objects that looked like twigs turned to stone. Still others revealed beautiful crystals and some had a glassy appearance. A similar collection can be obtained in almost any locality.

Classification. After the boys and girls had examined the specimens for themselves the teacher began his lessons. He asked the pupils to arrange them first into two groups, the hard and the soft rocks, and then to subdivide the hard rocks into those built up of rounded water- or wind-worn grains, those composed of crystalline grains, which show no wear, and a third class, those having a glassy appearance. The rounded grains of the first class, he pointed out, may be compared with the rounded grains of sand in rivers and seas and on deserts. From this comparison the pupils were led to conclude that originally these hard rocks were loose sands which later became consolidated. They are therefore called *sandstones*. The teacher went on to say that whenever they are so thoroughly consolidated as to split through the grains rather than around them, they are called *quartzites*.

All the glassy rocks, the pupils learned, were formed from a molten state only, and the hard non-fragmental granular rocks were once molten also. The grains of these interlock, and some have a crystal outline. These characteristics of grain develop only when rocks solidify from a molten or dissolved condition. Because great heat is necessary to make rocks molten they are called *igneous* rocks. *Igneous* comes from a Latin word meaning *fire*. Such rocks may be briefly defined as *hardened lavas*. See IGNEOUS ROCKS.

The pupils were then directed to test the soft rocks with muriatic acid. Those which gave off a gas they learned were *limestones*, the gas given off being carbon dioxide. The soft rocks which did not give off gas under the application of muriatic acid broke along parallel surfaces. The pupils noticed that these were fine grained, and that some were black and others gray and brown. Such rocks are called shales or slates, the slates being more compact than shales. The teacher told the pupils that shales and slates result from the consolidation of muds.

Next the pupils were told to look for fossils. These, the teacher explained, are relics of the plants and animals of a former era, which have been buried by natural causes in certain kinds of rock. They are to be found in the sandstones, quartzites, limestones and shales or slates, but not in igneous rocks. By a careful study of the specimens containing the fossils, and with the help of the teacher, the pupils arrived at the conclusion that these rocks must have formed from sediment that settled on the bottom of some body of water, slowly burying the plants and animals whose fossils the pupils had just discovered, and at the time these objects were buried the rock must have been soft mud. In time this mud dried and hardened into rock. Since these rocks were formed from sediment they are called *sedimentary* rocks, and since such rocks are usually formed in layers they are also called *stratified* rocks.

Each of the specimens was examined with a magnifying glass and its color and peculiarities were noted. In this way the principal minerals which form the rocks were learned.

They are quartz, feldspar, mica, hornblende, augite, clay, carbonate of lime and talc. (Most of these are described in these volumes. See also MINERALS AND MINERALOGY.)

What the Rocks Tell. As the next step in their lesson, Tom and his classmates learned in what way the rocks bedded in the earth throw light upon its history. Could the surface layer of *mantle* rock be removed from the land, that is, the upper layer of soil, clay, sand, gravel and broken rock, there would be exposed a zone of solid rock, possibly many miles thick. About four-fifths of this consists of rock arranged in layers, that is, stratified rock; the other fifth is crystalline. The crystalline rocks are of two types, igneous and *metamorphic*. This latter term is applied to rocks which exhibit marked changes from their original condition. Therefore metamorphic rocks may have been either stratified or igneous in their first state.

An examination of the successive layers of stratified rock shows that sometimes the different beds of rock have been deposited in regular order, one on top of another, without any alteration in the position of the surface on which they were deposited, and in other cases the underlying layers have an angle of inclination, different from that of the overlying beds. But whatever their position, we know that the overlying beds must have been deposited at a later period than the deeper ones, and so through these various layers we read backward to learn about the earth. The fossils in the sedimentary rocks indicate something of the kinds of plants and animals that lived when the rocks in which they are found were formed, and the pupils were intensely interested when their teacher told them that the youngest beds of rock prove that the life which existed when they were deposited bore marked resemblances to life of the present time.

Fossils in deeper rocks show more and more variations from life of to-day, and when the lowest that contain distinct evidences of life are reached, the evidences point to types far removed from those that we now know. The pupils were curious to learn if rocks had been found giving no evidences whatever of life on the earth when they were deposited. Their teacher told them that so far as geologists could learn, life may have existed when the most ancient rocks were deposited, for rock formations apparently without any fossils contain graphite beds or carbon-bearing slates and limestones. Carbon is a characteristic element of both plant and animal organisms and graphite is nearly all pure carbon. Furthermore, lime carbonate, of which limestones are composed, is formed through the agency of plants and animals.

The order of the formation of igneous rocks to a certain extent is revealed by the relation they bear to the stratified. In some cases the latter are broken through by lavas, showing that the stratified rocks were the earlier formed. In the majority of cases the metamorphic rocks lie beneath the sedimentary layers and are often broken through by igneous rocks. In the lowest rock series there is much igneous rock, and geologists generally agree that there was an early period of dominantly igneous activity. It is probable that this remote igneous era involved rather widespread volcanic conditions similar to those which occur locally at the present time. Throughout all geologic history sedimentary and igneous rocks have developed contemporaneously.

The story told by the rocks is not an unbroken record by any means, for no one has ever been able to proceed directly downward through the entire series of bedded rocks. Geologists have made their investigations from edges of various rock layers in places where by warpings or tiltings they have been brought to the surface, or where they have been exposed by the wearing away of overlying beds. Here and there, in one land and then another, throughout the world, the story has been read, and the records have been pieced together as completely as is possible with the data available. To the average person the amount of information gathered seems incredible. E.S.

The Story of the Earth

Its Origin. Tom and his classmates were now ready to follow their teacher far afield to learn the story of the earth. Question after question came to their minds. How was the earth formed? How did it reach its present condition? How long did it take for these changes to occur? Could such questions be answered? If so, how? These and many similar questions the geologists have attempted to answer, and some of their conclusions rest on a reasonable basis of fact. Others they have to admit are unanswerable.

Not one of the pupils had forgotten the story of the origin of the earth as it is given in the Bible: "In the beginning God created the heaven and the earth. And the earth was without form and void." Since these words were written, their teacher told them, a number of theories have been advanced by astronomers and geologists to explain the beginnings of the earth from a scientific point of view. Practically all, however, start with the idea that the earth and other planets of the solar system were evolved from a nebula of some kind. The theory known as the *nebular hypothesis* (which see) for a long time had wide acceptance. According to this theory the parent nebula was a body of hot gaseous matter that tended to take the form of a globular rotating mass. As this mass gradually cooled it contracted and threw off rings of rotating matter, each of which formed a planetary system.

A more recent theory, the *planetesimal hypothesis,* is now finding general favor with scientists who have rejected the nebular hypothesis because of certain grave defects. According to the newer theory the original nebula consisted of swarms of small bodies called planetesimals, which moved in orbits about a common center. As these small bodies pursued their slightly different orbits they came together and were welded by heat and pressure into those bodies we call the planets, planetoids and satellites. This process went on for ages, and the earth grew by capturing other planetesimals. The great central mass of nebula formed the nucleus of the sun. But the pupils wished to know how they could fill in the details. Were the mountains always here? Where did the water that fills the ocean basins originate? What is it like in the interior of the earth? This is what they learned.

The Interior. Geologists *infer* that the interior of the earth is hot because (1) hot vapors and molten lava from beneath the earth's crust are given out by volcanoes; (2) hot springs, in some of which the water is at the boiling point, are found in various parts of the globe; (3) as men proceed downward into mines and deep borings they find that the temperature increases at the rate of about 1° F. for every fifty or sixty feet of descent. It must be remembered in all discussions of the earth's interior that man has as yet merely scratched the surface. The deepest mines extend downward only a little over a mile, and it is almost 4,000 miles to the earth's center. Therefore the condition of the interior, that is, whether it be molten or solid, is also a matter of inference. Some authorities have believed the nucleus of the globe to be in a molten state; others think that except in certain local spaces, the earth is rigid and solid from surface to center. The first theory, that the interior is in a molten condition, is no longer generally accepted because the earth, in its relations to other members of the solar system, acts like a solid rigid body. Also, the average density of the earth is much greater than that of the rocks at the surface, pointing to an interior that is very dense and heavy. It seems probable to most geologists that the interior is solid, and so hot that under ordinary conditions it would melt. Melting is prevented, however, by the great load of the earth's crust, the melting point of rocks being raised by increase in pressure. It is held by many that the rock of the interior is molten only in those places where the pressure is relieved; that is, where the crust is upreared under mountain folds.

Air and Water. The origin of those two spheres of the earth that we call the atmosphere and the hydrosphere cannot positively be stated. Some of the theories once held are regarded now as of no more value scientifically than so many fairy tales. According to the nebular hypothesis the primitive atmosphere was of vast extent, heavy and very hot, and it contained all the water of the globe, as well as that portion of the carbon dioxide and oxygen now found in the atmosphere and in organic tissues. Also, these constituents were abstracted by the cooling earth from the atmosphere, which thereby suffered gradual depletion. It is not necessary here to go into details as to why this theory is weak; it is sufficient to say that a critical examination of the biologic and physical aspects of the earth shows that it rests on no foundation of fact.

A more plausible theory has been worked out by the geologists who hold to the planetesimal hypothesis. In brief, it is as follows: In the early stages of the earth's history it held a very thin atmosphere which grew as the earth grew, by capturing planetesimals from the central nebulous mass. When volcanoes came into action they added to the atmosphere by contributing to it, as they do to-day, water, carbon dioxide and other gases. As soon as the atmosphere became saturated with water vapor the latter was condensed into water, forming the beginning of the hydro-

sphere, and when water began to accumulate on the surface of the earth it gathered in depressions which ultimately became the ocean basins.

Great Earth Movements. Mountains, plateaus and continents have been formed by certain great periodic movements which began in the early stages of geologic history. Nearly all of the mountains are due to the *folding,* or wrinkling, of the earth's crust, and in a large number of cases the folded mountains are near the borders of continents, as the Coast Ranges of North America. Folded mountains, however, sometimes occur in the interior of continents, as the Urals and the Alps, and the mountains of Central Asia. (The eruption of igneous rocks is responsible for the formation of mountains of the volcanic type, such as Vesuvius and Rainier.) Plateaus are made up of great blocks of strata that have been elevated by earth movements of even greater magnitude than those which formed the mountains. The forces that caused the folded mountains took the form of horizontal thrusts; plateaus seem to have been raised by vertical forces. At the surface, the blocks that make up the plateaus are separated by fault-planes (see FAULT).

The continent-forming movements differ from the plateau-forming movements chiefly in magnitude, the former being much the more massive. Plateaus are simply parts of a continental mass that have suffered additional movement, and they bear about the same relation to a continent that one fault block of a plateau does to the plateau as a whole. It is supposed that plateau- and mountain-forming movements began with what geologists call the *master* movements—the sinking of part or all of the ocean bottoms. Simultaneously with the settling of the ocean basins occurred the *squeezing up* of the continents. Both the continents and the ocean basins are believed to have been formed very early in the history of the earth, and both have been subjected to various changes since then. The basins have suffered further sinking and the land masses further elevation; the tendency, too, has been for the basins to be extended and the continents to be restricted. These movements in turn have been offset by the building up of coastal plains along the borders of continents (see COASTAL PLAIN), and by the depositing of sediment on the ocean floor. It must be remembered that all of these changes are proceeding at an exceedingly slow rate. E.S.

Divisions of Time

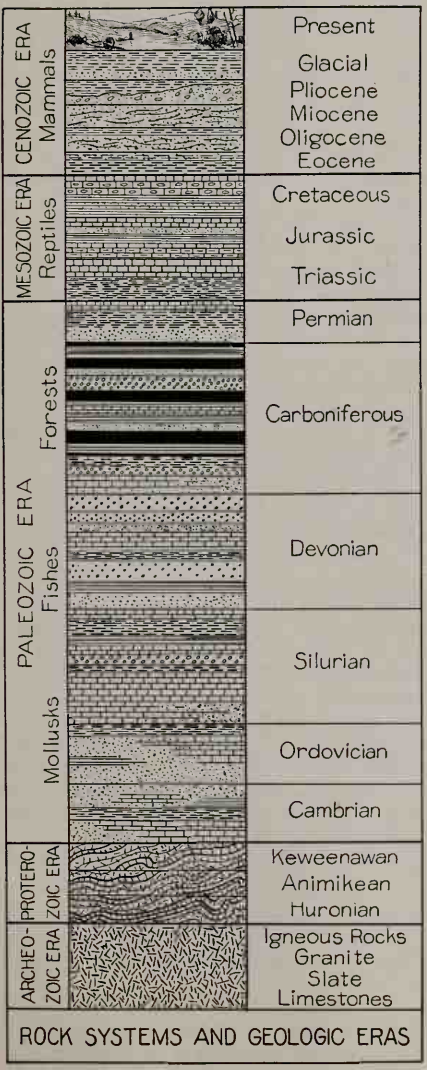
Principles of Division. Just as we divide present time into centuries, years and months, so do geologists divide the ages of the earth into longer and shorter periods. They are not all agreed upon some of these divisions, and there is a slight difference in the systems employed in Europe and in America. The divisions are founded upon some leading characteristic which indicates a great change from the conditions of a preceding time. No attempt is made to measure the length of these divisions in years, but the relative length of each period is estimated by the number and thickness of the rock systems it includes. A division including rocks of great thickness is considered to be longer than one whose formations are not so thick. All geologists consider the earth to have been in existence millions of years.

Eras and Periods. The large divisions of time are called *eras,* and each era is divided into *periods.* The names of these divisions indicate some prominent characteristics, or their order of occurrence. The *Archeozoic* Era is the era of *ancient life;* the *Proterozoic* Era, that of *earlier life. Paleozoic,* the name of the third era, means *old life. Mesozoic,* the name of the fourth era, means *middle life,* and *Cenozoic,* the name of the last, means *recent life.* In the publications of the United States Geologic Survey, the term *Algonkian* is used as a synonym for *Proterozoic.* The table on page 2439 includes the divisions of geologic time generally accepted by American geologists. It should be read from the bottom upward.

Eras Described. The rock formations of the Archeozoic Era are known as *Archean.* This system extends downwards to unknown depths and is composed largely of rocks of metamorphosed igneous origin, though there are some metamorphosed sediments. Its upper limit is generally assumed by geologists to be the base of the oldest system which is dominantly sedimentary. The Archean system contains some iron ore and ores of other metals, particularly gold, but these are deposited in comparatively limited amounts. No fossils of any kind have been found in the Archean series; thus there is no clue to the character of the life that then existed. The presence of life during this

era is inferred because of deposits of carbonaceous material and of limestones.

During the Proterozoic Era sedimentation for the first time became the principal process in the formation of rock. There is, however, considerable igneous rock with the sedimentary formations. To this era belong the formation of the iron ores of the famous Mesaba Range, in Minnesota, and of other Lake Superior regions in Wisconsin and Michigan. These ores were formed for the most part in the Animikean Period (see table). A few fossils have been found in Proterozoic rocks, but these are very rare. However, they make the existence of life in this era a matter of certainty. Other evidences are the presence of carboniferous shales and slates and of limestone.



The Cambrian, the first period of the Paleozoic Era, is of special interest and importance because its rocks constitute the oldest system known that contains an abundance of fossils. It is therefore the first satisfactory record of life. This system contains all the common aspects of sedimentary rocks—conglomerates, sandstones, shales and limestones—but in most regions the sediments have been cemented into solid rock. In some cases the sandstones have been changed into quartz schists, the shales into slates and the limestones into marble. Most of the fossils represent the shells or tracks of marine animals buried in sands and muds, but the absence of fossils of land species does not prove that no life then existed outside of the sea. Every great division of the animal kingdom except the vertebrate (backboned) animals was represented, but even though no vertebrate fossils have been found in the Cambrian series, geologists are not prepared to say that there were no vertebrate animals in that period.

Among the invertebrates known to have existed are several kinds of mollusks, sea worms, sponges, a few forms of the protozoa group (see PROTOZOA) and corals. Traces of soft jelly fish have been preserved. The highest in organization of the Cambrian animals was the trilobite, now extinct. It was related to the modern crab and crayfish and belonged to the arthropoda group (see ARTHROPODA). It is supposed that with the abundance of animal life there was a corresponding abundance of vegetable life, to furnish the needed food supply. Geologists also infer from the shells, plates and other forms of protective covering characteristic of so many animals of the Cambrian Period that other species existed of which the fossils bear no record, and against which the known animals had to defend themselves.

It is not possible here to take up in detail each of the succeeding periods, but certain striking developments may be pointed out. The fossils of the next period, the Ordovician, are almost entirely those of marine invertebrates, but among them are the first-known remains of fishes. The dominant group of animals is the Cephalopoda (which see), the

highest class of mollusks. Some of these grew to immense size, bearing shells twelve or fifteen feet long and a foot in diameter. On the land there were flying insects, implying the existence of vegetation and of an atmosphere that would be adapted to air-breathing creatures. The actual record of land plants, however, is meager and unsatisfactory.

The Silurian Period is marked by the formation of coral reefs, the first appearance of scorpions, and a rich and varied development of echinoderms (which see). Fossils of land life continue to be meager, and likewise little is known of plant life of the sea. Following this period is the Devonian, some of the rock formations of which are of importance commercially. The Upper Devonian, for example, is the chief source of oil and gas in the western section of Pennsylvania and one of the sources in West Virginia; the Middle Devonian in Ontario produces oil; and the Old Red Sandstone of Great Britain and Ireland is of the same period. In certain sections of Germany large quantities of iron, tin and copper have been taken from the Devonian series.

During this period (and thereafter) marine fishes were abundant, and there were sharks having fin-spines a foot in length. Barnacles of the modern *sessile* type, that is, attached directly by the base to other objects, made their first appearance, and there appeared and declined in this division of time a strange animal called *ostracoderm,* which formed a link between arthropods and vertebrates. It was related to the fishes, but entirely lacking in vertebrae. Plants, snails, insects, myriapods (thousand-legged worms), scorpions and amphibians (which see) are known to have lived on the land, and the Devonian Period saw the origin of ferns and of the gigantic progenitors of horsetail rushes and club mosses (see Horsetail Rush). Fernlike plants predominated.

The Carboniferous Period, divided into Lower and Upper Carboniferous, is an especially important epoch in geologic history from an economic standpoint. To the second division may be referred the rich coal measures of Pennsylvania (anthracite and bituminous), coal sections in Michigan, Illinois, and the states from Iowa to Texas, and the coal deposits of Nova Scotia and New Brunswick (see Coal). Iron ores of the system occur in Pennsylvania and Eastern Ohio, and oil and gas in Oklahoma, Kansas and Illinois. In Europe, workable coal of the Upper Carboniferous system is found in Great Britain, Ireland, Belgium, France, Spain, Germany, Austria and Russia, and the system is coal-producing elsewhere, as in China and Brazil.

From the Lower Carboniferous stage comes the earliest wood which shows rings, but the record of land life is as a whole inadequate. Sharks were supreme in the open seas and were more abundant than in any later period. On the other hand the record of land life of the Upper Carboniferous stage is unusually full. Gymnosperms (plants whose seeds are not enclosed in a seed-case) were present in great abundance. Giant ancestors of the modern horsetails grew in the forests to a height of sixty to ninety feet, and there were abundant growths of huge club mosses and fernlike plants. Since coal is of vegetable origin, the coal measures bear wonderful records of the complex plant life of the Upper Carboniferous age.

Animal life in this stage of the world's history is also abundant. On the land lived amphibians, insects (including cockroaches, locusts, crickets and bugs, but no moths, butterflies or flies), spiders, scorpions, myriapods and land snails. It is in the later coal measures that fossils of amphibians (the first land vertebrates) are first found in abundance and variety. Another important feature of the age was the development of fresh-water fishes, mollusks and crustaceans.

In the final period of the Paleozoic Era, the Permian Period, there were gigantic geographic changes, through which great areas of sea bottom were converted into land. As a result, both plant and animal life became greatly impoverished. Of the new plant types which appeared one is thought to be the ancestor of the group which includes the giant sequoia (which see). Before the end of the period the amphibians were overshadowed in numbers by the reptiles, their probable descendants. Though the differentiation between the two groups began earlier, the reptiles did not appear as a large and complex division until well into the Permian Period. Marine life was greatly depleted, but the fresh waters teemed with fishes of a somewhat modern character. Geologists have found that the Permian age presents numerous problems that are difficult of solution. This is due to widespread glaciation in India, Africa and Australia, near and within the tropics.

The Triassic Period, which ushered in the Mesozoic Era, was characterized by an extraordinary development of the reptilian class,

including crocodiles, flying saurians, lizards and other scaled reptiles. Before the period closed certain reptiles had made their home in the sea. There also appeared the race of dinosaurs (see DINOSAURIA), ungainly monsters that attained full development later in the era. In the Triassic series are fossils of a primitive form of mammals.

The Jurassic Period was characterized by an extension of the seas, as a result of which marine life again assumed a leading place in the geologic record. Among the fishes were the forerunners of the modern garpikes and sturgeons, and various sea reptiles made their appearance. Land life is especially interesting in that it exhibits slow progress towards types that exist to-day. The leading plants were cycads, conifers, ferns and horsetails. Among the animals were flesh- and herb-eating dinosaurs, some of the latter reaching a length of sixty feet. The herbivorous dinosaurs, which are first known in the Jurassic system, were horrible-appearing monsters, but unwieldy and stupid. In this period flying reptiles reached full development. Though small at this time, they later attained a wingspread of nearly twenty feet.

Of especial importance is the differentiation in this period of the oldest-known bird, a descendant of the reptiles. It had reptilelike claws, but its front limbs were adapted for flying and it was clothed with feathers. Traces of its reptilian ancestry may be seen in its long vertebrated tail and its toothed jaws. Up to this time the fossil record of mammals is very meager.

The Mesozoic Era closes with the Cretaceous Period, divided into Lower and Upper Cretaceous. By some geologists the Lower Cretaceous is known as the Comanchean and the two are considered as distinct periods. The earlier of these is characterized by one of the most striking evolutions in the history of plants—the appearance and widespread development of angiosperms (which see), plants whose seeds are enclosed in a seed-case. (It is possible that they had their origin in the late Jurassic Period.) With the development of flowering plants there was probably a corresponding development of insect life.

The later Cretaceous age is preëminently the coal period of the western part of the North American continent; and the close of the period was marked by extraordinary volcanic activity. Plant life on land began to assume a modern aspect, and among the present-day genera which appeared were those which include the birch, beech, oak, walnut, sycamore, tulip-tree and maple. Grasses had their origin in this age, and palms grew abundantly. The most important plants that support animal life had now made their appearance, laying the foundation for the future marvelous evolution of the higher animals. Reptiles, especially dinosaurs, continued their dominance among land animals; birds existed both on land and sea, but the marine birds were the more important. Turtles appeared for the first time in the ocean, and some of these were of enormous size.

The final era, the Cenozoic, brings us up to the earth as we know it to-day. The transition of life from the Mesozoic to the Cenozoic was characterized by four significant features: the appearance of new marine species; the practical disappearance of the great saurians and decided changes in other reptiles; the predominance of mammals, and the continuance of large numbers of Mesozoic land plants. Through the different periods of the Cenozoic there was steady progress toward life as it now exists. Before the close of the Eocene Period nearly all existing groups of mammals had become well defined. Primitive types of the horse, pig, hippopotamus, camel, dog and opossum appeared, and some mammals, like the land reptiles of the preceding era, took to the sea. Thus originated whales, dolphins, porpoises, manatees, dugongs, seals and sea lions. Nearly all types of marine invertebrates had assumed their modern forms.

The evolution of the higher animals through succeeding periods need not be discussed in detail. Representatives of *primates,* the highest order of mammals, to which man himself belongs, appeared in the Miocene Period, but the geologic record is singularly meager in regard to the origin of the human race. When geologists have had opportunity to study more carefully the tropical regions of the Eastern Hemisphere, the original home of the race, we may know more about this fascinating subject. It is also an unanswered question as to whether or not man existed in North America during the Pleistocene Period (see GLACIAL PERIOD), when thousands of square miles of its surface were covered by thick ice sheets. This and many other questions must be left to future investigations and discoveries. The forces that have brought the earth to its present condition have worked through unknown millions of years, and changes are still going on as the

earth pursues its unceasing course around the sun. It is possible that there will be another era in which man's spiritual and intellectual development will be comparable to the great physical and biologic evolutions of the past.

Geology and Mythology. We say, sometimes, without realizing that we are using figures of speech, that a volcano breathes out smoke; that the waves are angry; that a mountain lifts its head among the clouds; that the wind whistles; that the clouds threaten. With us, they are only figures of speech, but in the early days such expressions were more than that. The ancient Greeks and Romans lived in a region whose geological features could not be overlooked. It was no flat prairie country, the same to the north as to the south. There were mountains and mountain streams; there were volcanoes and earthquakes; there were chasms and rivers and deep, still lakes and the restless, wind-tossed sea; and for all of those things the active minds of the Greeks and Romans had to find explanations. To those ancient peoples everything was alive, not with merely human life, but with the life of gods. A man might blow a basin of water and make little waves upon it; what, then, more natural than that the wind, so like, on a large scale, the blowing out of a man's breath, should be the breath of some great god?

So they accounted for all the facts in nature which they saw about them. If they rose in the morning and found that the sea had become very stormy during the night and was hurling its great waves up on the shore, they felt that the sea god was angry, and they made offerings to him to buy back his favor. Anything so unusual as an earthquake or a volcanic eruption needed a very special explanation, so they invented histories that reached far back into the past, telling how the gods became angry with some huge giant and buried him under a mountain. His breath was the smoke of the volcano; his struggles to escape caused the earthquakes. A deep chasm or hole in the ground showed where some god had struck his spear, either in anger or because he wanted to get to the regions below the earth without taking a long way round. See MYTHOLOGY. E.S.

Consult Dana's *Geological Story Briefly Told*; Goodrich's *Wonders of Geology*; Heilprin's *The Earth and Its Story* (a first book in geology); Kingsley's *Madam How and Why—First Lessons in Earth Lore.*

Related Subjects. In addition to the following articles, which bear directly upon geology in some of its phases, these volumes contain many articles which are more or less closely related to the general subject. For these the reader is referred to lists under GEOGRAPHY; METALS; MINERALS AND MINERALOGY.

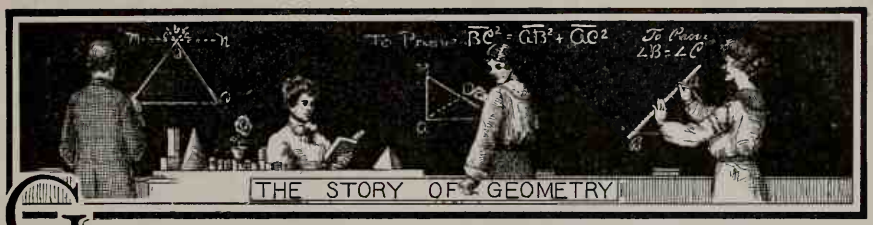
Algonkian System
Archean System
Azoic Era
Basalt
Bed
Boulder
Butte
Cambrian Period
Carboniferous Period
Cenozoic Era
Chalk
Clay
Coal
Conglomerate
Cretaceous System
Crystalline Rocks
Devonian Period
Diabase
Dike
Dinosauria
Dip
Dolomite
Drift
Eocene Period
Erosion
Fault
Flint
Fossil
Fuller's Earth
Geological Surveys
Glacial Period
Gneiss
Granite
Graphite
Gypsum
Hematite
Hornblende
Igneous Rocks
Joints
Jurassic Period
Kaolin
Limestone
Limonite
Marble
Mesozoic Era
Metamorphic Rocks
Metamorphism
Mica Schist
Minerals and Mineralogy
Miocene Period
Moraine
New Red Sandstone
Niagara Series
Obsidian
Old Red Sandstone
Ordovician Period
Paleozoic Era
Permian Period
Pliocene Period
Porphyry
Protozoic Era
Pumice
Quaternary Period
Ripple Marks
Rock
Sand
Sandstone
Serpentine
Shale
Silurian Period
Slate
Soil
Stratified Rocks
Tertiary Period
Trachyte
Travertine
Trenton Series
Triassic System
Tripoli
Tufa
Vein

GEOLOGISTS

Bell, Robert
Dana, James Dwight
Dawson, Sir John William
Geikie, Sir Archibald
Heilprin, Angelo
King, Clarence
Le Conte, Joseph
Lyell, Sir Charles
Muir, John
Powell, John Wesley
Shaler, Nathaniel S.
Tyndall, John
Van Hise, Charles Richard
Winchell, Alexander

PHYSIOGRAPHIC TOPICS

Air
Alluvium
Canyon
Climate
Coastal Plain
Delta
Desert
Divide
Dust, Atmospheric
Earth
Earthquake
Fall Line
Geyser
Glacier
Hill
Island
Lake
Mountain
Ocean
Physical Geography
Plateau
Talus
Tides
Tornado
Valley
Volcano
Wind

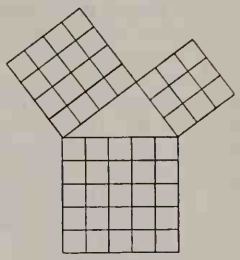


GEOMETRY, *je om' e tri.* A great city had fallen, and soldiers were rushing through its streets, putting to death all who gave them the slightest excuse. As one burly soldier crossed the market-place he saw, seated on the ground, an old man whose ears seemed deaf to the tumult around him and who seemed to see nothing but the figures he was tracing with his finger in the sand. The soldier stopped, wondering whether these might perhaps be magic figures, and as his shadow fell upon the markings the old man looked up. "Don't touch my circles!" he cried; but the soldier, angered at the commanding tone, ran him through the body with his sword. The general in command grieved over the death of this old man, took upon himself the support of his relatives, and erected in his honor a stately tomb. He did this despite the fact that the old man had done all in his power against the invaders in aiding in the defense of the city; for in such reverence did the ancients hold learning, and especially the marvelous science of circles and angles and spheres, which is called *geometry,* or *earth-measuring.*

The sacked city was Syracuse, in Sicily, which fell before the Romans in 212 B.C.; the drawer of the mystic figures was Archimedes, one of the greatest mathematicians of antiquity (see ARCHIMEDES). Geometry is not like that simpler form of mathematics which we call arithmetic—a comparatively modern science; the former existed in a fairly complete form two thousand years ago.

The Story of Geometry. It is probably true that geometry had its beginnings in practical problems. The ancient Egyptians, for instance, had great difficulty in preserving boundary lines between the fields which each year were flooded by the Nile, and when the waters subsided they had to make new surveys or "land-measures"—and hence the name *geometry.* Now in making these surveys it was very necessary that they know how to mark off correctly right angles. The Egyptians had never heard the rule which every student of arithmetic learns—that the square of the hypotenuse of a right-angled triangle is equal to the sum of the squares of the other two sides; but they had worked out, no one knows how, the fact that if they measured off with their ropes a three-sided figure whose sides were in the relation of 3, 4, 5, the large enclosed angle would be a right angle.

In their plans for the pyramids, too, the Egyptians must have made use of many of the principles with which geometry concerns itself, but it cannot be said that they ever really developed a science of geometry. This was left for the Greeks to do. Thales was the first Greek to make a systematic study of the subject, but more famous than he was his disciple Pythagoras (which see), who worked out that proposition about right-angled triangles which the Egyptians had felt after blindly, and which is still called for him the *Pythagorean Theorem.* Philosophers found this new subject quite to their taste, and Plato and Aristotle contributed much to its development; but it was left for Euclid, a Greek of Alexandria who lived about 300 B.C., to win the title of "father of geometry" (see EUCLID). He organized everything that his predecessors had discovered, added new problems, and set forth all his knowledge in his *Elements,* a book on which the teaching of geometry has ever since been based. Indeed, his name is practically a synonym for *geometry.* "To-morrow's Euclid is hard," says the English schoolboy, and no one misunderstands him.



PYTHAGOREAN THEOREM

A figure which shows that the square drawn upon the hypotenuse of a right-angled triangle is equal to the sum of like squares drawn upon the other two sides.

The next really great geometrician was Archimedes, who died, as related above, in

212 B.C. His work was rather in solid than in plane geometry, and he had left a request, which was faithfully carried out, that there be cut on his tomb a sphere inscribed in a cylinder, because the working out of that problem he felt was his greatest achievement. All through the Middle Ages there was little interest in geometry, and though this was awakened at the time of the Renaissance no real advance was made in the science until within the last two centuries. It is useless to discuss in such an article as this these more recent developments, as they all relate to the more abstruse phases of the subject. Suffice it to say that the problems over which the schoolboy nowadays puzzles his brain are the very problems which interested Euclid.

What Geometry Concerns Itself With. The above discussion of the way in which geometry has developed does not really tell what it is. Perhaps the simplest definition is to say that geometry is the "science of space;" that is, it concerns itself with the relations and properties of *points,* which have position but not magnitude; *lines,* which have but one dimension, length; *surfaces,* which have two dimensions, length and breadth; and *solids,* which have three dimensions, length, breadth and thickness. This may sound at first rather theoretical, but geometry is an eminently practical subject. If a man wishes to bisect (cut in two equal parts) a given line or a given angle; to inscribe one figure in another; to drop a perpendicular to a line from a point without the line; to draw a line parallel to a given line through a given point; to make an angle equal to a given angle—to do any of these or a thousand other things which not only the architect, the stonecutter or the draughtsman, but the carpenter or the amateur craftsman may be called upon to do at any time, only geometry can help him to perform his task simply and accurately. Indeed, many of the problems which geometry has solved have grown out of just such popular needs.

Branches of Geometry. The geometry taught in secondary schools is called *elementary,* no matter how difficult and "advanced" it may seem to the student who is becoming acquainted with it for the first time; and elementary geometry is divided into two branches —*plane* and *solid* geometry. Plane geometry treats of all figures which lie in a plane—that is, which have not more than the two dimensions of length and breadth and have no part of their surface curved; while solid geometry treats of simple solids, or objects having the three dimensions of length, breadth and thickness, such as cylinders, cubes, spheres or cones. With any other curve than that of the circle, or with plane surfaces or solids bounded by any other curves, elementary geometry has nothing to do.

It was elementary geometry almost entirely to which the ancients who built up the science devoted themselves, but modern mathematicians have worked out two great systems in addition—*analytical* geometry and *projective* geometry.

Analytical geometry is in reality a sort of combination of geometry and algebra. The relations of geometric figures are expressed in algebraic terms, equations are formed and worked out just as in algebra, and the resultant equation is translated back into geometric figures. This makes possible the study of more complex curves than elementary geometry can deal with. First of all, the laws of conic sections may be understood by means of this algebra-geometry process. If a cone be cut in a plane parallel with its base, the cut surface is a circle, but if it be cut in any other way the surface resulting is bounded by less simple curves; and these less simple curves, or conic sections, as they are called, are favorite subjects of analytical geometry. Spirals, too, and wavy lines, cannot conceal their properties and their relations from the person who has mastered this higher form of geometry. The problems worked out are all too difficult for solution here, but it is interesting for even the beginner to know that such an all-embracing form of geometry does exist.

Projective geometry is abstruse enough in its working out, but in its principles it is simple. It studies not figures themselves, but their *projections.* Does that sound difficult? If, walking on a sunny day with the sun behind you, you look downward, you will see there your shadow, long or short according to the height of the sun. That shadow is your *projection,* and it is like you in some ways—it has a head and two hands and two feet; but it is not by any means a duplicate of your figure. Now there are certain laws which govern projections and their relation to the figure from which they are projected, and with these laws projective geometry concerns itself. Old maps are very quaint and hard to understand, because the ancients did not know anything about the projection of a sphere on a flat surface, which is exactly what map-draw-

ing amounts to; the earliest photographs were hazy and uncertain of line, because the men who made the first cameras did not understand well enough the projection of the sitter's face on the sensitive plate. There are also many other very important and practical applications of projective geometry. Of course it is not necessary for the schoolboy who toils over the map of Europe, or for the girl who delightedly "snaps" baby sister's picture with her kodak to know the underlying principles or even to know that there is such a thing as projective geometry; but the proper fulfilling of their tasks is possible just because somewhere, some time, wise men worked out those principles.

Terms Used. The student beginning elementary geometry finds himself brought face to face with many new and strange terms. In algebra, as in arithmetic, the things he was called on to solve were called problems. Here he hears talk of *propositions* and *theorems, corollaries, axioms* and *hypotheses,* or sees at the bottom of a solved "problem" the mysterious letters *Q. E. D.* or *Q. E. F.* A few definitions, however, will make all of these plain:

A *proposition* is the statement of some truth that is to be proved or of some operation that is to be performed. A proposition of the former type, which states some truth that may be logically demonstrated, is a *theorem;* one of the latter type, which proposes a question for solution, is a *problem.* Thus, "The sum of the three angles of a triangle is equal to two right angles" and "Construct a square equivalent to the sum of two given squares" are both propositions, but the former is a theorem, the latter a problem.

A *corollary* is a truth easily deduced from one or more propositions already proved. Thus, if it is true that the sum of the three angles of a triangle is equal to two right angles, it follows as a self-evident corollary that a triangle can have but one right angle or one obtuse angle.

A *demonstration* is the proof of a theorem; a *solution* is the process of solving a problem.

The *hypothesis* is the "if" part of a proposition—the part which states the thing or things taken for granted; the *conclusion* sets forth the things which are to be proved true. In the proposition *"If two sides of a quadrilateral are equal and parallel,* the figure is a parallelogram," the part in italics is the hypothesis, the rest the conclusion.

Q. E. D. is the abbreviation for the Latin words *Quod erat demonstrandum,* meaning "which was to be proved," and is placed at the close of the *demonstration* of every satisfactorily proved theorem.

Q. E. F. means *Quod erat faciendum,* or "which was to be done," and is placed at the close of the *solution* of any geometric problem.

One of the terms used very frequently in geometry is *axiom,* which means a *self-evident truth.* Geometry seeks to prove most things about the properties and relations of lines, surfaces and solids; it takes a few for granted, calling them true in the very nature of things. Who, for instance, would think of questioning the statement that "Things equal to the same thing are equal to each other"? That is an axiom, and there are many others, of which the following are perhaps most important:

1. If equals be added to equals, the results will be equal.
2. If equals be taken from equals, the remainders will be equal.
3. The doubles of equals are equal.
4. The halves of equals are equal.
5. The whole is greater than any of its parts.
6. The whole is equal to the sum of all its parts.
7. Between two points only one straight line can be drawn.
8. A straight line is the shortest distance between two points.

Then there are *postulates*—not quite so self-evident as axioms, but very clearly possible; and these, like the axioms, were set forth by Euclid and have helped to form the basis of geometric reasoning ever since. Some of the more important ones are as follows:

1. Any magnitute can be bisected.
2. A straight line can be continued indefinitely in either direction.
3. A circle can be drawn with any radius, and from any point as center.
4. A straight line can be drawn from any point to any extent in any direction.

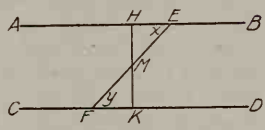
How Geometry Proves Things. Given a theorem to be proved, geometry goes about it in a very definite way. In the first place, nothing must be assumed. There must be proper authority for every step in the process; and proper authority lies only in an axiom, a postulate, a definition, or a proposition already proved. But all theorems are not proved in exactly the same way; there is a *direct* and an *indirect* method. The former consists either in superimposing one figure upon another, or in starting out with some unquestionable fact and proceeding step by step by means of axioms, postulates or theorems already proved to a conclusion which *must* be correct because every step in it has been taken with full authority. The following is a direct proof:

If two parallels are cut by a transversal, the alternate interior angles are equal.

Hypothesis: AB and CD are parallel lines, cut by the transversal EF.

Conclusion: Angle x=angle y.

Proof. Through M, the middle point of EF, draw HK perpendicular to AB.



HK is also perpendicular to CD. (It has been proved that "a straight line perpendicular to one of two parallels is perpendicular to the other."

Apply the figure MKF to the figure MHE so that the equal vertical angles at M shall coincide, MK falling along MH, and MF along ME. (It has been proved that all vertical angles are equal.)

Then F will fall on E,

for MF equals ME by construction;

and FK will fall along HE,

for FK and EH are both perpendicular to HK. (A previous theorem has proved that "from a point without a line, only one perpendicular can be drawn to the line.")

Therefore the angles x and y coincide and are equal, for by definition "the test of equality of any two magnitudes is that they can be made to coincide." Q.E.D.

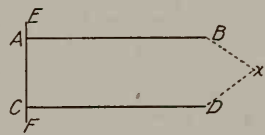
In an indirect proof something is assumed as true, and known truths and demonstrated propositions are built upon it until it is shown that if the original assumption be not true the result is an absurdity—a self-evident falsity. This method is known as the *reductio ad absurdum,* or *reduction to an absurdity.* The following demonstration gives a very simple example of this interesting method:

Two straight lines in the same plane, perpendicular to the same straight line, are parallel.

Hypothesis: AB and CD are two lines perpendicular to the line EF.

Conclusion: AB and CD are parallel.

Proof. Could AB and CD, if produced far enough, meet at some point, as x, there would be two perpendicu-



lars drawn from the point x to the line EF. But this is impossible, for it has been proved that "from a point without a line only one perpendicular can be drawn to the line."

Therefore AB and CD cannot meet.

Therefore AB and CD are parallel.

For by definition, "lines in the same plane which cannot meet, however far produced, are parallel." Q.E.D.

It will be evident from these two examples that the order in which theorems are to be demonstrated is fairly well determined, for each demonstration must make use of only what has been proved before—it cannot reach forward to what is to come. In plane geometry, the simplest form and therefore the most interesting to most students, there are about 130 important propositions, but there are many minor propositions which are no less interesting, and many corollaries which are difficult to prove, no matter how simple they may appear to be.

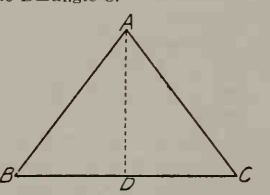
Some Famous Theorems. There are some theorems which are particularly famous, either because of some special difficulty, some neatness in the demonstration, or some historical interest. There is the *pons asinorum,* for instance, as "asses' bridge." From time immemorial, it seems, dull scholars have found difficulty with this proposition, which Euclid made the fifth in the first book of his *Elements.* Here it is, with its proof:

In an isosceles triangle, the angles opposite the equal sides are equal.

Hypothesis: ABC is an isosceles triangle, having AB equal to AC.

Conclusion: Angle B=angle C.

Proof. Draw AD bisecting the base BC.



The triangles ADB and ADC are equal;

for AD=AD, by identity,

DB=DC, by construction,

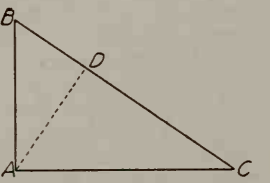
and AB=AC, by hypothesis;

and it has been proved that "two triangles are equal if the three sides of one are equal respectively to the three sides of the other."

Therefore angle B=angle C,

for it has been proved that "homologous angles of equal triangles are equal. Q.E.D.

Then there is the so-called Pythagorean Theorem, one of the most practical and useful of all the propositions of geometry — "The square of the hypotenuse of a right-angled triangle is equal to the sum of the



squares of the other two sides." Simple enough it seems, when all the necessary preliminaries are proved, but its demonstration, with that of its necessary preliminaries, is one of the surest proofs that Pythagoras was a brilliant reasoner.

Hypothesis: BC is the hypotenuse of the right triangle BAC.

Conclusion: $\overline{BC}^2=\overline{AB}^2+\overline{AC}^2$.

Proof. Draw AD perpendicular to BC.

Then $\overline{AB}^2 = BC \times BD$

and $\overline{AC}^2 = BC \times DC$ (for it has been proved that "if in a right triangle an altitude is drawn to the hypotenuse, each leg of the triangle is a mean proportional between the hypotenuse and the adjacent segment").

Adding, $\overline{AB}^2 + \overline{AC}^2 = BC$ (BD+DC) or $= \overline{BC}^2$ (for by axiom, "if equals be added to equals, the results are equals"). Q.E.D.

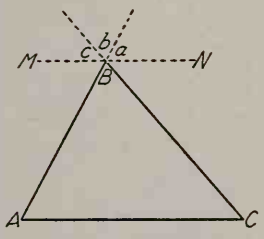
Another theorem which lies at the basis of many propositions in geometry, and which is also credited to Pythagoras, is the one which declares that:

The sum of the three angles of a triangle is equal to two right angles.

Hypothesis: ABC is any triangle.

Conclusion: Angle A+angle B+angle C= two right angles.

Proof. Draw MN through B parallel to AC, and produce AB and CB, forming angles *a*, *b* and *c*.



Then angle A= angle *a*, being corresponding angles of parallel lines, which have been proven equal; and B=angle *b*, being vertical angles, which have been proven equal;

and angle C=angle *c*, corresponding angles of parallel lines.

Adding, angle A+angle B+angle C=angle *a*+ angle *b*+angle *c* (for by axiom "if equals be added to equals the results are equal").

But angle *a*+angle *b*+angle *c*=two right angles, for "the sum of all the angles that can be found at a point in a straight line and on the same side of the line, is equal to two right angles."

It is impossible to list here all the theorems which are especially interesting; indeed, the interest is not fully apparent when they are inspected in this disjointed manner. Only as the student follows logically from one theorem to the next can he feel the full joy that geometry has to give.

Why Geometry Is Studied in School. Geometry is usually accepted without question as one of the important subjects in a secondary school course. Few arguments have to be made for it, so apparent is its value. First of all, it lies at the basis of the whole science of measurement. To be sure, now that the theorems and problems have been fully worked out, the results have been in a measure passed on to arithmetic and are there stated as rules, so that a person may figure out the amount of carpet needed for a certain floor, the cubic capacity of a wheat bin or of a hogshead, the height of a tree, or many of the other practical problems without knowing the fundamental principles of geometry on which these problems are based. However, knowledge of geometry enables him to apply his rules far more intelligently, as well as to work out new applications for himself.

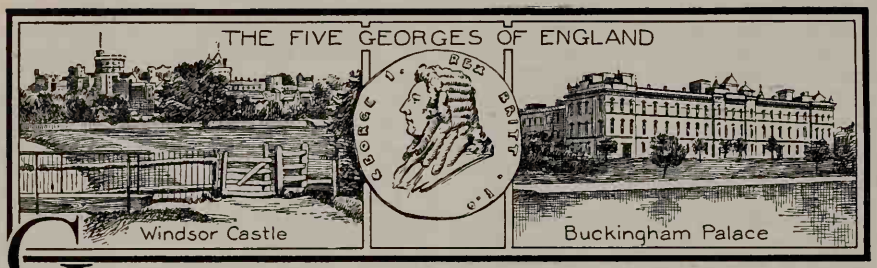
But geometry has other values, as important if not so practical. Its logical plan, the way it proceeds from step to step without allowing for any gap in the reasoning, develops the reasoning powers in a way impossible to any subject which admits of more hit-or-miss methods. Nor are all the theorems and problems of geometry worked out and set down in the textbooks for the student to memorize. Any good book contains a large number of original propositions which the student must work out for himself, and nothing proves more clearly his mastery, not only of geometric principles but of the workings of his own mind, than the ability to work out a theorem clearly and with the fewest possible statements make his demonstration clear to others. There is a joy which must be felt to be appreciated in detecting a fallacy or a gap in the reasoning, or in tracing out the definition, axiom or proposition which makes it plain that some elusive point is actually provable.

To sum up, no study can quite take the place of geometry as a cure for slovenly habits of thinking, and until some such substitute can be found it seems likely to hold its place, even for those who have no practical use for its teachings. E.D.F.

Consult Klein's *Famous Problems in Elementary Geometry;* Smith's *"History of Modern Mathematics"* in Merriman and Woodward's *Mathematics.* First books in geometry may be purchased from any schoolbook publishing house.

Related Subjects. In addition to the topics referred to in the above discussion, there are in these volumes many articles which are more or less closely connected with geometry. The reader is referred to the following:

Angle
Area
Axiom
Circle
Cone
Cube
Curve
Cylinder
Degree
Ellipse
Line
Magnitude
Mensuration
Plane
Polygon
Prism
Pyramid
Quadrilateral
Rectangle
Rhomboid
Rhombus
Sphere
Square
Square Measure
Trapezium
Triangle



GEORGE, the name of five kings of England, of the House of Hanover. The early Georges were unpopular because they were more German than English, but the present bearer of the name (George V) is an Englishman, with a strong hold on the affections of his people.

George I (1660-1727) came to the English throne on the death of Queen Anne in 1714. He was a great-grandson of James I of England, but his father was elector of Hanover and he had been born and brought up in Germany. In 1698 he succeeded his father as elector, and three years later was declared heir to the British crown. No opposition was made to his accession, but his utter lack of sympathy with England's traditions and ideals, as well as his loose morals, prevented any personal affection for him in Britain, while in the government he did not even pretend to exercise much influence. As he could not understand English, he did not attend the Cabinet meetings, and indeed, he preferred to spend his time among his old friends in Hanover rather than in his island kingdom. The chief event of his reign was the bursting of the "South Sea Bubble," and it was not the king but Walpole who saved England in that crisis.

George II (1683-1760) was the son and successor of George I. He, too, was born in Hanover, and was thirty-one years old at the time of his father's accession to the English throne. Thus he was almost as German in his sympathies as was his father. In 1708, while he was electoral prince of Hanover, he fought with distinguished gallantry under the Duke of Marlborough, and in 1727 came to the throne as king of Great Britain and Ireland. Walpole, Carteret and Pitt were among the men who guided the nation during the reign of this second George. To his credit it may be said that despite his obstinacy he was always willing to follow his ministers' advice if he could be convinced of its wisdom. Great colonial expansion marked George's reign, Clive laid the foundations of a vast empire in India, and Wolfe, by his victory on the Heights of Abraham, ended French control in North America and gave Canada to Britain.

George III (1738-1820). The reign of this third George is of peculiar interest to Americans, for at its beginning the thirteen English colonies in America were still possessions of England, discontented at times but on the whole loyal; while at its close they had become a prosperous and independent nation which had twice held its own against the mother-country in war. George III succeeded his grandfather, George II, in 1760, and proved in some ways very different from his predecessors. He was a man of high moral character, and his home life with his wife, Charlotte Sophia of Mecklenburg, was most happy. George had no intention of giving over the government to ministers—he wished to be the real ruler, though not in the absolute manner of the old Stuart kings. He tried minister after minister, but not until North was put in charge of affairs in 1770 did he find one exactly to his liking. For the twelve years that North was in office the king practically dictated the national policies, and it was largely his determined attitude toward the colonies that brought on the American Revolution. During the ministry of Pitt the war against France, which grew out of the excesses of the French Revolution, was vigorously prosecuted.

More than once during his long reign the king suffered from mental derangement, and in 1811 he became hopelessly insane. The Prince of Wales governed as regent, and on the death of his father in 1820 became king as George IV.

George IV (1762-1830). While he was yet Prince of Wales his immoral life, his unfilial conduct and his repeated attempts to divorce his wife, the Princess Caroline Amelia of Brunswick, had almost broken his father's

heart and had lost him the respect of the people; but through it all he bore the proud title of "the first gentleman of Europe" because of his gallant manner, his cleverness and his exquisite dress. In the important events of his reign, which included the Napoleonic wars and the passing of the Catholic Emancipation Act, he had little part. He left no descendants, and his brother, William IV, succeeded him.

George V (1865-) bears the sounding title of "George V, by the Grace of God of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India." He was born June 3, 1865, and was the second son of Edward VII, but on the death of his elder brother in 1892 became heir prospective to the throne. Meanwhile, he had received a thorough training in the navy, starting at the age of twelve as cadet and enduring the same discipline as his shipmates. In 1893 he became captain, in 1901 rear admiral and in 1903 vice admiral, though after 1892 he was not in active service. He was married in 1893 to the Princess Victoria Mary of Teck, who has borne him six children, the eldest of whom, Edward, Prince of Wales, was born in 1894.

GEORGE V

Son of Albert Edward (Edward VII), grandson of Queen Victoria, and cousin of Emperor William of Germany and the former Czar Nicholas of Russia.

After his father's accession in 1901, George made a tour of the world, chiefly to acquaint himself with conditions in the British colonies, and on his return was associated with his father in governmental affairs. At Edward's death in 1910 he became king, the coronation taking place June 22, 1911. Unlike his father, King George is of a quiet, retiring nature, caring little for social affairs, and his people knew little of him at his accession. His popularity, however, was immediate and lasting.

Consult Thackeray's *Four Georges;* Melville's *The First George in Hanover and England;* Lucas's *George II and His Ministers;* Walpole's *Memoirs of the Reign of George III;* Melville's *The First Gentleman of Europe* (referring to George IV); Hudson's *Our Sailor King* (referring to George V).

Related Subjects. The following articles in these volumes contain much information as to the history of the period of the Georges:

Clive, Robert	Pitt, William
French and Indian Wars	Revolutionary War in America
Great Britain	South Sea Company
Subtitle *History*	Walpole, Sir Robert
North, Frederick, Lord	Wolfe, James

GEORGE, David Lloyd (1863-), a British statesman whose aggressive and virile personality has made itself felt in all the important reforms and events of recent English history. Could his character be summarized in a sentence, he would perhaps be described as a man with an intense and dominating love of democracy, and both his friends and his opponents would agree that he has a positive genius for getting things done. Only a man of decision and action could have sponsored or initiated in conservative England the great movements that are identified with his name—old-age pensions, insurance against sickness and nonemployment, educational and land reforms, etc.—or have attained the Premiership, as did he, at a time when England was involved in the most desperate struggle of modern times—the War of the Nations.

DAVID LLOYD GEORGE

The first Premier of Britain to come from the middle classes. He assumed a greater burden than ever fell to any of his predecessors.

This small, energetic, intensely earnest man is of Welsh descent. He was born in Manchester, the son of William George, a poor schoolmaster who died when David was about two years old. The mother, a daughter of David Lloyd, sent the boy to Wales, where he was reared by an uncle. The future Premier

adopted his mother's family name as a part of his surname, and has always called himself Lloyd George. He prepared himself for the profession of law, and as early as 1890, when he was only twenty-seven, he had become sufficiently well known to win a seat in Parliament. Yet it was ten years before he had opportunity to prove his ability. Late in 1899 England began war with the Boers in South Africa, and throughout the conflict that followed Lloyd George opposed the government with a vehemence and an indignation that made him the most hated man in the country. In fact, in 1900, he was mobbed in Birmingham while attempting to make a speech in the town hall. Then, after the war, public opinion changed, and the people began to estimate at their true value Lloyd George's high courage and uncompromising independence.

In 1906 he entered the Campbell-Bannerman Cabinet as President of the Board of Trade, carried on the work of that office with brilliant success, and in 1908 succeeded Herbert Asquith (which see) as Chancellor of the Exchequer. The next few years witnessed momentous changes in English constitutional history. Taking up the old-age pension bill which Asquith, then Premier, had already begun to advocate, Lloyd George saw it through its final passage, and then introduced into Parliament his famous budget of 1909. This provided for radical increases in the taxes of the well-to-do, as additional revenue was needed to carry out the various social reforms of the government. The rejection of this budget by the House of Lords, its passage by a newly-elected Parliament and the loss of the veto power by the House of Lords are matters of English history that will always be connected with the name of Lloyd George.

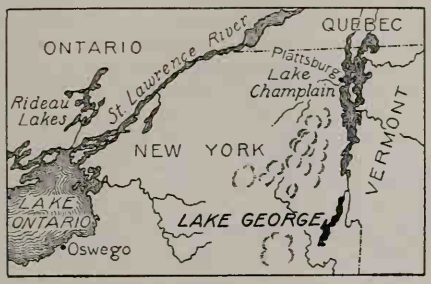
In 1911 this fiery little champion of the people's rights stirred the country with another great reform—insurance of the workingman against accident, sickness and unemployment. In 1913 he began a campaign to equalize the land rights in England, but ere the movement was fairly launched its sponsor was interrupted by a catastrophe that overshadowed all domestic matters—the outbreak of the great war. As was to be expected, the Chancellor of the Exchequer became a commanding figure in this new crisis. In May, 1915, when Premier Asquith formed the coalition Cabinet, Lloyd George was made head of the new Department of Munitions, and it is characteristic of him that in this position he told the officials of the War Office that he would multiply their program for manufacturing munitions by eight. Not only did he keep his promise, but eventually he multiplied it by sixteen, besides bringing a chaotic state of affairs to one of system and order. A year later, in June, 1916, when Secretary of War Kitchener was drowned, Lloyd George succeeded him as head of the War Department, and at the end of that year, in December, he took up the duties of the Premiership, relinquished by Asquith. According to a new arrangement, Lloyd George became head of the War Council, but resigned to Bonar Law the political leadership of the House of Commons. B.M.W.

GEORGE, Henry (1839-1897), author of the economic theory of the single tax (which see), and one of the few Americans who has made notable contributions to economic science. The underlying doctrine of the single tax, that all men have equal right to the use of land, just as they have of air and sunlight, is not original with George, but he made the first clear statement of a method by which this right could be enforced without increasing the machinery of government.

From his fourteenth year George worked to support himself, and to the end of his life he was a poor man. He shipped as a foremast boy on a vessel bound for Australia, hunted gold in British Columbia, learned the printer's trade in California, and finally became a newspaper reporter and editor in San Francisco. As he matured he began to meditate on the economic conditions he saw about him, on the riches acquired suddenly by the fortunate owners of gold-bearing lands. It was here that he first realized that the individual landowner is seldom, if ever, responsible for the increase in the value of his property. His theories were first stated in a pamphlet, *Our Land Policy,* published in 1871. A more complete statement is found in his famous book, *Progress and Poverty,* published in 1879.

This book made George the prophet of a new social and economic creed, and the remainder of his life was devoted to lecturing and writing on the land question and other economic and political subjects. While not politically ambitious, he twice accepted an independent nomination for mayor of New York City, which was his home after 1883. He was defeated the first time, and died during his second campaign for this office, when victory seemed almost assured.

GEORGE, Lake, a lake in the eastern part of the state of New York, which figured historically in two wars and was in turn under the control of the French, the English and the colonists during the early history of America.



LOCATION MAP

The lake has a length of thirty-six miles and a varying width of from one to three miles, and forms part of the boundary between Warren and Washington counties. It is one of the most picturesque lakes in the world and is a favorite summer resort. The head of the lake is at the town of Lake George, formerly called Caldwell, from which point it extends northeast and discharges into Lake Champlain.

During the French and Indian and Revolutionary wars, the vicinity of Lake George was a great battleground. Forts were built at Ticonderoga by the French and at the head of the lake by the English. The battle of Lake George was fought on September 8, 1755, between the French and the Indians. A monument was unveiled to mark the spot on September 8, 1903, the state of New York having purchased the land now known as Battle Park Reservation. Cooper, the novelist, called the lake Horicon, but the name was changed by General William Johnson in August, 1755, and that of Lake George was given, in honor of the English king, George III. See Ticonderoga, Battles of.

GEORGE, Saint, the patron saint of England. The life of George is surrounded by legends and little is definitely known of him. Most accounts state that he was of Cappadocian parentage, but born in Lydda. He became a soldier and rose to high rank under Diocletian, but his open profession of Christianity led to his arrest, and after suffering cruel tortures he was put to death at Nicomedia, April 23, A. D. 303. Saint George was highly venerated by the Crusaders, and in 1350 was proclaimed the patron saint of England. The red cross of Saint George on a white background was long worn as a badge by English soldiers and is retained in the Union Jack (see Flag). The familiar legend of Saint George and the Dragon arose from confusion of the Saint with Perseus, the pagan hero who slew the sea monster that threatened Andromeda (See Perseus). Saint George is also the patron saint of Russia and Portugal. In many European countries, though not regarded as a patron saint, George is venerated and has been made the tutelary saint of many orders.

In the United States there is a fraternal and benevolent order styled *Sons of Saint George,* with branches in most large cities. The object of this nonpolitical association is to further social intercourse and to assist those of English descent in America.

GEORGE ELIOT. See Eliot, George.

GEORGE I (1845-1913), king of Greece from 1863 to 1913, was the second son of Christian IX of Denmark, and a brother of the Dowager Queen Alexandra of England. In 1862 the Greeks deposed their ruler, King Otto, and the following year the national Parliament elected to the kingship the Danish prince, who was then called William. Having gained the consent of his family and of Great Britain, France and Russia, under whose protection the kingdom had been established, Prince William ascended the throne in 1863 as George I. Four years later he married Princess Olga, daughter of the Russian Grand Duke Constantine. On March 18, 1913, just fifty years after he ascended the throne, King George was assassinated by a lunatic, during the Balkan War (see Balkan Wars). He was succeeded by his eldest son, Constantine, Duke of Sparta. See Constantine I.

GEORGE JUNIOR REPUBLIC, a miniature republic in which boys and girls are the citizens and fill the offices, and in which some special duty is expected of every member. It has a constitution modeled on that of the United States, calling for an executive department, a legislature of two houses and a judicial department. This interesting community is near Freeville, N. Y., and was organized by William R. George for the purpose of giving to poor and unfortunate and even apparently incorrigible children the chance to grow into useful men and women. Mr. George had for several years conducted summer outings for the children of the city slums and had become convinced that only through aid in self-government could they be really benefited. Endow-

ment for his scheme was not difficult to secure, and in 1895 it was launched. For a year he was president, but since 1896 all offices have been held by the boys.

From twelve to eighteen is the admission age, and children from any part of the United States may be enrolled as citizens. All, no matter how young, must work, for "Nothing without labor" is the motto, and all under the age of sixteen must attend the school of the community. An attempt is made to encourage those who have a desire for further education to go on through high school and college, and some of its members have had successful and honorable college careers. For those for whom scholastic training holds no charms, however, there is a choice among numerous vocations. They may take up carpentry, blacksmithing, farming, plumbing or printing, while for the girls there is training in sewing, cooking, laundry work and other branches. In addition to the cottages in which the citizens live, the community has its schoolhouse, its bank, store, library, government building, restaurants and workshops.

Other junior republics have been founded elsewhere, but criticism as to the methods employed has by no means been lacking. By 1913 complaints became so persistent that the State Board of Charities took the matter in hand, and Mr. George gave up his position as overseer, with the result that the republic practically ceased to exist. A number of the men who were interested then got together, subscribed a new endowment fund, and requested Mr. George to assume control. With his acceptance of their request began a new era of prosperity for the community. A.MC C.

GEORGE'TOWN, the county town of Kings County, Prince Edward Island, noted chiefly for its lobster-packing industry. It is situated on the eastern coast of the island, forty miles east of Charlottetown, by rail, and forty-five miles north of Pictou, N. S., by steamer. Georgetown is an ideal summer resort, with fine facilities for fishing, bathing and shooting; it has a considerable trade in agricultural produce. The most prominent buildings are the post office and customhouse, the courthouse and the town hall. The population in 1916 was about 1,000.

GEORGETOWN, originally STABROEK, as a Dutch village, is the capital of British Guiana, and is on the east shore of the Demerora River where it reaches the Caribbean Sea, in latitude 6° 29′ 24″. The population in 1915 was 53,176. The city is regularly built, with wide, shady streets, through some of which flow cooling canals. The buildings, of wood or of brick and plaster, are airy and comfortable, and the city is characterized by neatness and sanitary care. The principal government building is of Elizabethan form. Georgetown has both Anglican and Roman Catholic cathedrals, an immense hospital, a fine museum rich in native fauna, a botanical garden (suburban), and many wharves built out into the river for ocean ships. There are electric lights and street cars and a good telephone service. Water for drinking is obtained from rainfall, but for protection against fire and for many other purposes is supplied through mains in the streets.

Georgetown has foundries, and various factories for making cigars, rice products, chocolate, and articles for local domestic use. Its chief connections are by water, along the coast and up the rivers. The production of gold in the colony in 1912 reached $879,800. The city is prosperous and well governed, but the property qualification reduces the voters to a very small part of the population. The Portuguese are very numerous, and own about two-fifths of the real estate.

GEORGETOWN UNIVERSITY, a Jesuit educational institution at Georgetown, D. C. (now a part of Washington), was founded in 1789, and in 1815 was given authority by Congress to confer degrees. Since 1833 it has had Papal consent to give degrees in philosophy and Catholic theology. The university maintains a college, a graduate school, a medical and dental school, a law school and an astronomical observatory.

GEORGE WASHINGTON UNIVERSITY, an institution of higher education located at Washington, D. C., the successor of the Columbian College of the District of Columbia, which was chartered by Congress in 1821. In 1873 the name was changed to the Columbian University, and in 1904, by act of Congress, the school became the George Washington University. The old Columbia College was under the control of the Baptist Church, but when the present name was adopted the institution was made undenominational.

The university embraces the college of arts and sciences, school of graduate studies, Columbian College (for undergraduates, with courses leading to the degrees of bachelor of arts and bachelor of science), college of engineering and mechanic arts, teachers college, the departments of law, medicine and dentistry,

and the associate colleges. The latter, which have separate boards of trustees, consist of the colleges of pharmacy and veterinary medicine. The institution is maintained largely by friendly subscription pledges and by tuition fees. The location of the university buildings in the heart of the city gives the students ready access to the valuable materials collected by the national government in its museums, libraries, laboratories and archives. About 1,350 students are regularly enrolled, and the staff of instructors numbers about 180.

GEORGIA, *jor'ji a,* a South Atlantic state of the United States, known popularly as THE EMPIRE STATE OF THE SOUTH. It was the largest of the original thirteen states, and is still, with its area of 59,265 square miles, the largest state east of the Mississippi River. To the north of Georgia are Tennessee and North Carolina, to the east South Carolina and the Atlantic Ocean, to the south Florida and to the west Alabama. The Savannah River forms almost the entire boundary between Georgia and South Carolina, and the Chattahoochee about half of that between Georgia and Alabama. For the state flower the school children selected the Cherokee rose, one of the most beautiful of all roses, which grows abundantly in the state. In August, 1916, the legislature legalized the choice.

The People. In size the nineteenth among the states of the Union, Georgia ranks tenth in population, and among the Southern states is second only to Texas. In density of population, however, it ranks above Texas, and is in turn surpassed in this respect by Kentucky, North and South Carolina, Virginia and Tennessee. At the formation of the Union, Georgia had 82,500 inhabitants; in 1910 it had 2,609,121, while its estimated population in 1916 was 2,860,209. White people do not greatly predominate, for in 1910 there were 1,431,802 whites and 1,176,987 negroes. There are some counties, especially in the central parts of the state, where there are more negroes than whites.

In Georgia, as in most of the other Southern States, a large proportion—almost four-fifths, in fact—live under what may be called rural conditions; that is, either on farms or in towns of less than 2,500 people. In this proportion, however, there is a tendency to shift, the urban population increasing much more rapidly than the rural. Four cities have a population of more than 25,000: Atlanta, the capital and largest city; Savannah, near the mouth of the Savannah River, the chief seaport; Augusta and Macon, important centers of the cotton industry. Other cities of note are Columbus, Athens, Waycross, Rome and Brunswick. Some of these have had a remarkable growth since the beginning of the twentieth century, Waycross increasing over 150 per cent between 1900 and 1910.

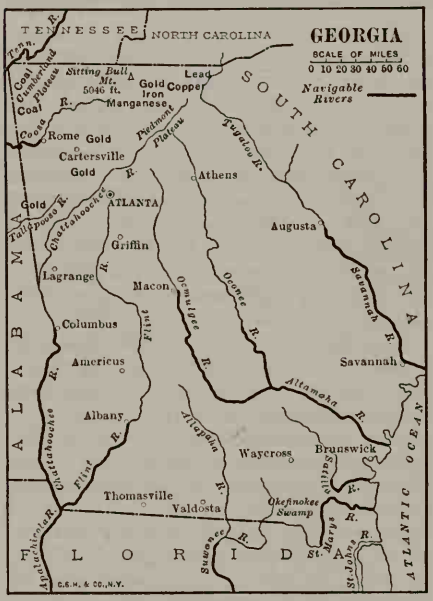
This Empire State of the South differs very decidedly from the Northern Empire State, New York, in its proportion of foreign-born inhabitants. In the latter this is very large, while in Georgia but six-tenths of one per cent of the population are of foreign birth. Thus far, it has been almost entirely unknown soil to the immigrants.

Education and Religion. To say that the percentage of illiteracy in Georgia is 20.7 does not give a fair idea of the progressiveness of the state, for it is the large proportion of negroes which makes it so high. In comparing statistics it must be remembered that there are more colored people in Georgia than in any other one state. Among the whites, only seven people out of one hundred are unable to read and write. As in the other Southern states, the educational problem is difficult of solution, not only because of the negroes, but because the rural population is so large. There is no compulsory education law in the state, but every possible effort is made to convince the people of the value of schooling. The public school system, which includes primary, secondary and collegiate schools, is becoming

better every year. In the larger cities and towns there are graded and high schools for both white and colored children, and the total enrollment of colored pupils is about two-thirds that of the white.

The University of Georgia (which see), which admits only men, is a part of the public school system. Among other institutions of higher learning are the South Georgia State Normal College at Valdosta, the State Normal School at Athens, the Georgia School of Technology at Atlanta, Andrew Female College at Cuthbert, and many other schools of academic or college rank.

Religion. Among religious sects, the Baptists are by far the strongest, having more members



GEORGIA

The map shows boundaries, locates the highest point of land in the state, names the principal rivers and the leading cities, and shows the locations of mineral wealth.

than all the other churches combined. Next in order are the Methodists, of whose 300,000 members about one-third are colored. The founder of Methodism, John Wesley, visited the colony with his brother Charles in 1736, and George Whitefield, one of the most powerful preachers of that denomination, founded an orphanage near Savannah in 1738, but it would be incorrect to trace the strength of Methodism in the state to these early influences.

Surface Features. The different topographical regions of Georgia are well marked, though in general it may be said that there is a gradual slope from the northern part toward the coastal plain in the southeast. In the north a triangular section with an area of about 6,000 square miles is crossed from northeast to southwest by the Blue Ridge Mountains. These are not towering peaks, the greatest elevations not reaching 6,000 feet, but their abrupt valleys, steep cliffs and domelike summits make up a scenic region of surpassing beauty. In the extreme northwestern corner, in that portion of the Cumberland Plateau which projects into the state from Tennessee, is located Chickamauga National Military Park, a memorial of the great battle fought on September 19 and 20, 1863. The area of the park itself is fifteen square miles and the roads for miles on each side of it have been beautified and made a part of the park system. Monuments and tablets at various points make clear the maneuvers of the battle, and at places the forest-growth which covers the park has been cleared away, that the movements may be traced.

On the south the Blue Ridge district gradually gives way to the Piedmont Region (which see), a section of rolling country diversified with broad hills and narrow valleys. The northern edge of this region is about 1,500 feet in altitude, but at the fall line, where the land drops to the coastal plain, it is only about 300 feet. The direction of this fall line may be interestingly traced on the map, for its course across the state is marked by a line joining the cities of Columbus, Macon, Milledgeville and Augusta. These cities do not just happen to be at the fall line—they were located there that they might take advantage of the excellent water power which the drop in the rivers furnishes (see FALL LINE).

Stretching away to the southeast is the coastal plain, with an area more than half that of the entire state. For the most part this is low and level, but here and there occur ridges and valleys which seem like miniature mountain ranges. In the southeastern corner, extending into Florida, is the Okefinokee Swamp, one of the largest swamps in the United States. Low marshy tracts, where moccasin snakes and alligators abound, are interspersed in this great swamp region with islands overgrown with trees and dense underbrush. It has never been fully explored, for its dangers are as numerous as its beauties.

Rivers. Georgia has 540 square miles of water surface, and is one of the best watered of the states. The rivers of the northwestern valley region and those which are confined to the coastal plain are for the most part rather sluggish, but most of the great rivers might join the Chattahoochee in its wonderful *Song*, as written by Sidney Lanier, the Georgia poet:

> I hurry amain to reach the plain,
> Run the rapid and leap the fall,
> Split at the rock and together again,
> Accept my bed, or narrow or wide,
> And flee from folly on every side
> With a lover's pain to attain the plain;

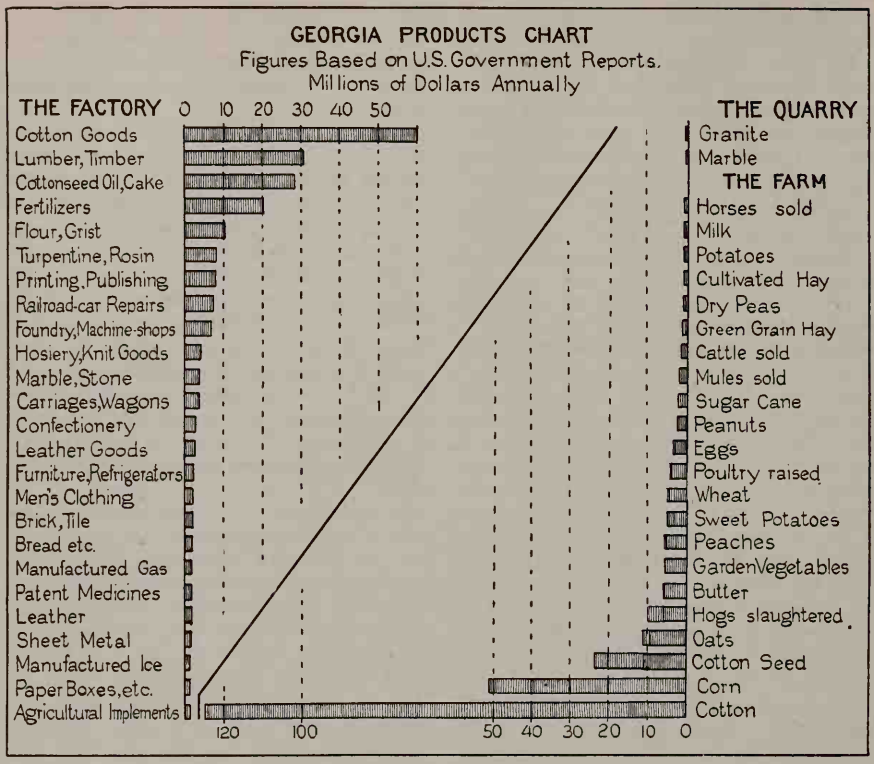
for they rise in the mountains, cross the Piedmont Region, and finally find their way to the plain, where they are large enough to carry down to the Atlantic or the Gulf of Mexico the traffic of the territory through which they flow. The extreme northernmost portion of the state is drained into the Tennessee, and thence by a roundabout course through the Mississippi into the Gulf of Mexico, but most of the drainage of the state finds its way directly to the Atlantic or the Gulf. The large rivers are, from east to west, the Savannah; the Altamaha, formed by the junction of the Oconee and the Ocmulgee; the Flint and the Chattahoochee. The first two empty into the Atlantic, the Flint joins the Chattahoochee just at the boundary line of Florida, and the last-named river, through this latter part of its course called the Apalachicola, finds its way to the Gulf.

Manufactures. The manufactures of the state are best considered in connection with its rivers, for it is the rivers which have in large part made them possible. Excellent water transportation, and a possible water power of at least 500,000 horse power, have combined to make this the foremost industrial state of the South. Especially since 1890 have manufacturing enterprises increased. In 1899, the total manufactured products amounted to $94,532,000, while in 1909 these had increased to $202,863,000 and in 1914 to $253,320,000. In this last year almost 120,000 persons were employed in the various establishments within the state.

It would almost be possible, by a study of the other industries of Georgia, to assume what the chief manufacturing enterprises must be. The state is a great cotton producer, and cotton goods rank far ahead of any other manufactured product. Sixty-seven per cent of the surface of the state is under forests, and lumber and timber products rank second. Other manufactured products of importance are fertilizers, cottonseed oil and turpentine and rosin. These all depend either on the growth of cotton within the state, or on its wooded character.

Mining. Georgia is particularly fortunate in having such abundant water power in certain sections, as its supply of coal is not extensive, and only a few hundred thousand tons are mined each year. Indeed, the mineral wealth of the state is not great. Iron, the only metal of any considerable importance, is even less valuable than coal. A little gold is found, seldom as much as $20,000 worth in a year. By far the chief mineral products are clay, excellent in quality and suitable for brick and tile, and building stones of various kinds. Especially important is the marble, that found in the northwestern part of the state being the purest and whitest produced in the United States.

Its Agriculture. The chief industry of the state is agriculture, which in the present century has advanced even more rapidly than manufacturing. Georgia's crops in 1899 were worth only $86,000,000, but by 1915 they had risen in value to more than a quarter of a billion dollars yearly. Because the climate shows a decided variation, a wide range of crops can be produced. The soils, too, most of which are very fertile, are various. On the coastal plain where the climate is mild and delightful, and the growing season nearly nine months, cotton is raised in vast quantities—the sea-island, or long-fiber, variety on the islands along the coast and the upland variety farther inland. Until recently cotton formed over two-thirds of the total crops of the state, and Georgia is second only to Texas in its production, with a yield usually nearly a million bales ahead of any other state. But a state dependent upon a single crop for its income passes through alternate periods of prosperity and poverty, and Georgia farmers have been quick to see this. Increasing acreage has been given to corn, which now yields the state about $50,000,000 a year, sometimes more than half as much as cotton. Oats, too, have advanced in value from $4,000,000 in 1909 to about $12,000,000, while wheat brings about $4,000,000 instead of less than $1,000,000. Of the other field crops hay, sweet potatoes, peanuts and sugar cane are important; the last two grow almost entirely in the southwestern part of the state. Georgia and North Carolina lead the other states in sweet potato production.



Georgia peaches are known everywhere, and the state often stands second to California in the number of bushels picked. In the present century the annual yield has increased from about a quarter of a million to over five million bushels. Other fruits are of less importance, though one of them, the pomegranate, grows in very few states. Pecans flourish both on the coast and in the inland counties.

In the mountainous portion of the state there is an abundance of pasturage for sheep and cattle, and hogs are numerous in the wooded districts.

In all, nearly three-fourths of the land of Georgia is called farm land, but less than one-third of this is actually cultivated, much of it being in forests. Many of the smaller farms are operated by negroes, either owners or tenants, and there has been a really remarkable development along agricultural lines of the colored people of the state in recent years.

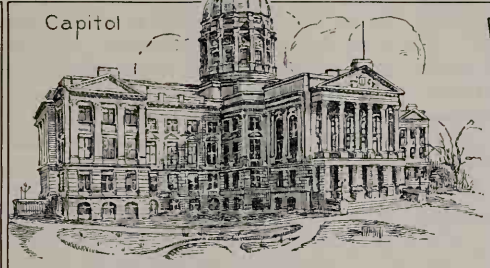
Reference has been made above to the extensive forests of Georgia. These are to be found in every part of the state, but their composition differs in different localities. The *Song of the Chattahoochee,* quoted here, describes accurately the northern forests:

> The hickory told me manifold
> Fair tales of shade; the poplar tall
> Wrought me her shadowy self to hold;
> The chestnut, the oak, the walnut, the pine,
> Overleaning with flickering meaning and sign,
> Said "Pass not, so cold, these manifold
> Deep shades of the hills of Habersham,
> These glades in the valleys of Hall.

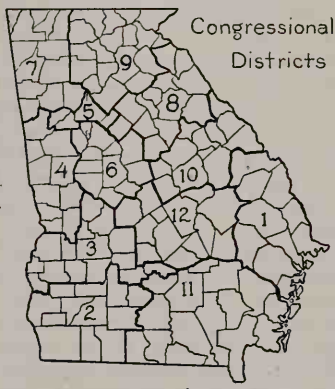
In the southern part, on the other hand, the forests are chiefly of the famous Georgia pine, the most important tree of the state.

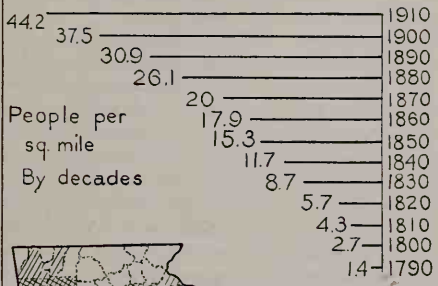
Transportation and Trade. Georgia has, as stated above, a large number of navigable rivers, but that it is not dependent upon these is proved by the fact that its greatest city, Atlanta, the "Gate City of the South," is not on or near a waterway. Indeed, the rivers are being less and less used for transportation as the railroad mileage increases. There are at present in the state over 7,300 miles of excellent railway, the Central of Georgia, the Southern Railway, the Seaboard Air Line and

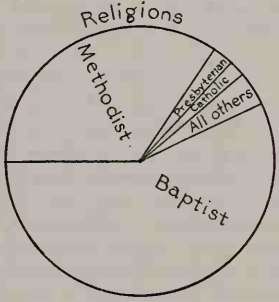
GEORGIA

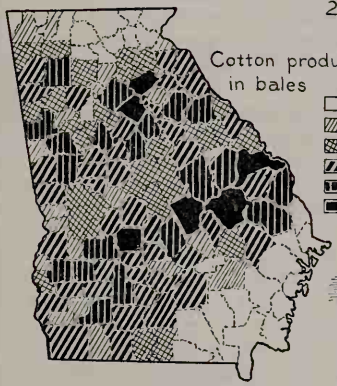


Capitol









Oglethorpe's Fort
Saint Simon's Island

University of Georgia

the Atlantic Coast Line having the greatest mileage. Atlanta, Savannah, Augusta, Macon, Columbus, Athens and Waycross have become important railroad centers, and Savannah is also one of the chief seaports of the South. In the harbor of the city the United States government has excavated a channel twenty-six feet deep.

The commerce of Georgia with the other states is large, chiefly owing to its production of cotton and marble; for, while the manufacture of cotton products is ever increasing, by no means all the raw material is used in the state. Cotton goods, too, are exported, as well as lumber and other forest products, while the imports consist of those manufactured articles and food products not raised with profit.

Government. Georgia is governed under a constitution which dates from 1877. Since that time no exceedingly important amendments have been made, but the legislature of 1907 passed several statutes which are of the utmost importance. One of these, which went into effect on January 1, 1908, in spite of violent opposition, provided for statewide prohibition; the other concerned itself with suffrage. By the terms of the latter law, which had as its object the elimination of the negro vote, no one has the right of suffrage unless he can read intelligently or write accurately from dictation a paragraph from the Federal or the state constitution. That this may not deprive illiterate white citizens of the vote, there are other provisions, which allow certain property or patriotic qualifications to take the place of the educational one.

The executive department of the government is in the hands of a governor, secretary of state, comptroller, treasurer, attorney-general, commissioner of agriculture, state superintendent of schools, state geologist and state librarian, all of whom are elected for two years. After he has served two terms consecutively, the governor may not be reëlected for four years.

The legislative department consists of a house of representatives and a senate, the latter body having forty-four members and the former not more than 184. Members of each house are elected for two years and the legislature holds annual sessions of not more than fifty days.

The judicial power is vested in a supreme court consisting of a chief justice and five associates, chosen for six years by popular vote; a court of appeals composed of three members, also elected by the people for a term of six years; and superior courts, which are held in each judicial district. There are also courts of ordinary, justices of the peace, and solicitors-general for each judicial district.

History. Georgia, which was named for George II of England, was the most southerly of the thirteen original colonies. Its territory was explored in 1540 by De Soto, and in 1562 Ribault sailed along its shores. The Spaniards, seeking everywhere for gold, sank their mines in its mountains, and though they found no gold they discovered traces of other metals sufficient to lead them to oppose the efforts of the English to seize the land, for Georgia was a part of the original Carolina grant.

Colonial Period. In 1732 the British government ceded the territory to a company organized to "establish the colony of Georgia in America," and very early in the next year James Oglethorpe landed with his first colonists. His object was to found a settlement where poor debtors from England and Protestants who had been driven by persecution from Europe might find a refuge. Savannah was established in 1733, but even under its liberal government the colony was not exceedingly prosperous. The Spaniards of the neighboring territories never ceased their aggressions, and in 1740 the Georgian colonists were involved in actual war with them, proving themselves, though unsuccessful, brave and skilful fighters.

Oglethorpe returned to England in 1743, and affairs in the colony became worse and worse. Slavery and rum, which by the original rules of the colony were forbidden, were introduced in 1749. Three years later the colony gave up its charter, and was organized as a royal province under the control of the British Parliament. If left to itself, Georgia would have continued quietly under this rule, for there was little cause for complaint given; but the spirit of the other colonies affected it also, and it sent delegates to the Continental Congress. During the War of the Revolution that followed, Georgia bore its part, and as a result suffered at the hands of the British.

Early Years of Statehood. In 1778 Georgia ratified the Articles of Confederation, and ten years later was among the first to ratify the Federal Constitution. The most pressing questions in these early years of statehood concerned the Creek and Cherokee Indians, who during most of the history of the colony had been distinctly unfriendly. Control of the Indian lands was eagerly sought, and in 1802 the

RESEARCH QUESTIONS ON GEORGIA

(An Outline suitable for Georgia will be found with the article "State.")

How is one of the great conflicts of the War of Secession commemorated in this state?

Why does the fact that there are many streams with a rapid fall mean more to Georgia than it would to Pennsylvania?

Discuss briefly the dependence of Georgia's manufacturing industries upon its natural resources.

Who was chiefly responsible for the strong Union sentiment that existed in the state at the outbreak of the War of Secession?

What notable religious teachers visited the colony in its early days?

If Georgia's chief crop were destroyed, who besides the planters would suffer? Would it make much difference outside of the state?

Give and account for a popular name that is applied to the state and one that is applied to its capital.

What were the chief Indian tribes of the territory? What was the cause of the friction between them and the white inhabitants?

What makes the educational problem a difficult one in this state? What attempts are being made to solve it?

How large a percentage of the population is employed in the industrial establishments of the state?

If you should suddenly open your eyes in a Georgia forest, how would you know whether you were in the northern or the southern part of the state?

What brought about a change for the worse in the condition of the colony about 1749?

What state of the North bears a popular name much like that of Georgia? How do the two states differ as to the character of their population?

What great river of the state receives a new name as soon as it crosses the boundary?

How large a part of the so-called farm land is actually under cultivation? Is the remainder mere waste land?

Who founded the colony of Georgia? How did it rank among the original colonies as to age? For whom was it named?

How many cities have more than 25,000 people? Is the tendency of the inhabitants towards the farm or towards the city?

What fruit raised in Georgia is famous throughout the country?

Who was the first white man to explore the territory? What was the aim of the Spaniards in establishing settlements?

How many states are larger than Georgia? How many of these are east of the Mississippi? How many Southern states have a greater population?

Why has the tendency been of late towards diversified farming rather than towards an increase in cotton production?

What sort of a region is Okefinokee Swamp? Why has it never been fully explored?

What were the most important legislative enactments of the early twentieth century?

What is the state flower?

How many states raise more cotton?

state gave up to the Federal government all its territory west of the Chattahoochee in return for the promise that the title of the land should be gradually taken away from the Indians and vested in the state. This did not settle the matter, however, and at intervals open warfare broke out, while conflicts between the state and Federal governments were frequent. But in 1832 the Creeks were driven out, and six years later the last of the Cherokees removed from the territory.

War and Reconstruction. Though Georgia was industrially as dependent upon slave labor as were the other Southern states, and though it held most firmly to the conviction that the Federal government had no right to prohibit slavery in a territory or to refuse admission to a slave state, there existed a strong sentiment in favor of the Union. The leader in this was Alexander H. Stephens, one of the strongest and most capable men that the South developed during the war period. Despite his efforts, however, the election of Lincoln was followed by the calling of a convention, which on January 19, 1861, passed an ordinance of secession, 208 delegates voting for it and eighty-nine against it.

During the war Georgia was the scene of important military operations (see WAR OF SECESSION), including Sherman's march "from Atlanta to the sea," and few, if any, of the states suffered more. Four-fifths of the public property, it was estimated, was destroyed during the raids of the Northern forces, and the commercial depression that followed was very serious. Nor did the reconstruction policy inaugurated by President Johnson better matters. Carpetbaggers (which see) gained control of the government, and the wealth of the state was wasted in reckless speculation and in frauds. Within three years the public debt was increased from $5,000,000 to $16,000,000, and the accusations of embezzlement against men in high government positions were not in all cases unfounded. The ordinance of secession was repealed and a new constitution adopted, but Congress, as was natural under the circumstances, objected to the attitude of the state toward the negroes, and set up military rule; and not until the beginning of 1871 was the state finally readmitted.

Recent Development. The history of the state since the Reconstruction period has been largely one of progress and development of the abundant resources. Two expositions, one in 1881 and one in 1898, were held at Atlanta, and both gave evidence of the prosperity of the state and of the large part which cotton was likely to play in its further development. The growth in manufactures, considerable as it is, has but begun, and the industrial future of the state appears most promising.

Politically, Georgia has been since 1871 almost uniformly Democratic, though between 1890 and 1898 the Populists gained a strong influence. In 1907 Hoke Smith, who had been Secretary of the Interior in President Cleveland's Cabinet, became governor, and it was he who signed the prohibition bill which went into force the next year. He also actively supported a far more popular legislative act—that which took the vote from the negroes (see *Government,* above). O.B.

Other Items of Interest. The prohibition law forbids the sale within the state of periodicals carrying liquor advertisements, and more than one newsdealer has paid a substantial fine for violation of the provisions.

In 1916 there was reopened near Atlanta the university named for the founder of the colony, Oglethorpe. This was originally established in 1835, but was forced to close its doors during the War of Secession, and had never before attempted to reorganize.

Recently the state has been devoting much attention to improving its unprogressive mountain sections, with a view to stamping out illiteracy. Better rural schools, night classes for adults, and extensive new highways form a part of the scheme.

The state owns the Western & Atlantic Railroad, which it built before the War of Secession. It is leased to the Nashville, Chattanooga & Saint Louis Railway until 1919.

Georgia was the latest founded of the thirteen original colonies.

Scientists recognize in the United States nine climate belts, and Georgia has examples of all but one of these. The lowest, which has an average yearly temperature of less than 40°, is to be found only on the mountain tops.

Georgia was the home of Eli Whitney at the time of his invention of the cotton gin.

Consult Harris's *Stories of Georgia;* Derry's *Story of Georgia;* Brooks's *History of Georgia.*

Related Subjects. The following articles in these volumes will help the reader to gain a more detailed knowledge of the state of Georgia:

CITIES AND TOWNS

Albany	Atlanta
Americus	Augusta
Andersonville	Brunswick
Athens	Columbus

Macon	Savannah
Rome	Waycross

EDUCATION

Georgia, University of

LEADING PRODUCTS

Corn	Nut
Cotton	Peach
Lumber	Peanut
Marble	Sugar Cane
Melon	Turpentine

RIVERS

Chattahoochee	Savannah

SURFACE FEATURES

Appalachian Mountains	Piedmont Region
Blue Ridge	Stone Mountain

GEORGIA, a region celebrated for the beauty of its women and the strength of its men, containing the Russian provinces of Armenia, Caucasus and part of Asia Minor, lying between the Black and Caspian seas. This territory was surrendered to Russia by its king, George XIII, in 1798. The first authentic history of Georgia traces back to Alexander the Great. At the close of the second century the crown was given to the king of Armenia. The Arab invasions began a century later, and for two hundred years the inhabitants of Georgia were compelled to accept the Mohammedan religion at the point of the sword. Political relations between Russia and Georgia began in 1492 when the king sought protection of Ivan III of Russia during a war between the Persians and Turks. Early in the eighteenth century assistance was asked of Peter the Great, and in 1829, Guria, the last state of Georgia, submitted to Russia. Wine, cotton and fruit are produced in this region.

GEORGIA, UNIVERSITY OF, the oldest state university in the United States, located at Athens, Ga. It was chartered in 1785, but was not formally opened until 1801. According to the provisions of its charter, the primary and secondary schools of the state have an official connection with the university; it is also at the head of the public school system.

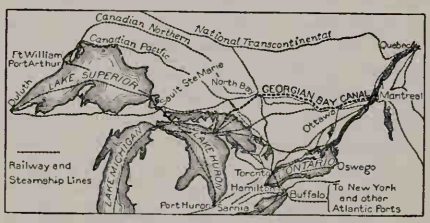
The institution includes the following colleges and departments: at Athens, Franklin College of Liberal Arts, the state agricultural college, the graduate school, the law department and the state normal school; also, the North Georgia agricultural college, at Dahlonega; the medical college, at Augusta; the school of technology, at Atlanta; the normal and industrial school for girls, at Milledgeville; the South Georgia state normal college, at Valdosta; and the Industrial College for Colored Youths, at Savannah.

The total enrollment of students in all departments is about 650, and there are about seventy members on the faculty. The university library contains 45,000 volumes. Except in the professional schools, tuition is free to residents of the state.

GEORGIAN, *jor'ji an,* **BAY,** formerly called LAKE MANITOULIN, an arm of Lake Huron, lying wholly in the province of Ontario. It extends eastward from Lake Huron, from which it is almost completely shut off by Manitoulin and other islands and by the Bruce Peninsula. Between Manitoulin Island and the mainland on the north is the North Channel, a picturesque little strait, with rocky bluffs along the shore. The eastern shores of the bay are low and rocky, but on the north they are high and bold, like the north shore of Lake Superior. The most striking feature of the bay is the vast number of small islands, said to exceed 20,000, which dot its waters. The attractiveness of these islands for summer homes and hotels is drawing a rapidly increasing number of temporary residents, with the result that Georgian Bay is perhaps best known as a summer resort.

Georgian Bay is about 120 miles long and fifty miles wide, and in many places exceeds 300 feet in depth. Numerous rivers empty into it, chief among them being the French, from Lake Nipissing; the Muskoka, from the chain of lakes of that name, and the Severn, from Lake Simcoe. The Trent Canal, though now only of local use, will provide a through water route from Georgian Bay to the Bay of Quinte on Lake Ontario, and the Georgian Bay Ship Canal will provide a through route to Montreal.

Georgian Bay Ship Canal. A ship canal to connect Montreal directly with Lake Huron has long been under consideration. In 1904 a



GEORGIAN BAY SHIP CANAL
Showing, also, its rail and water connections, if proposed plans are followed.

board of engineers was appointed by authority of the Dominion Parliament to investigate, from an engineering point of view, the practicability of the proposed waterway. The

board's report, issued in 1909, established the feasibility of the canal and submitted details for a waterway 440 miles long, with a minimum channel of twenty-two feet. The canal would begin at the mouth of the French River, in the northeast corner of Georgian Bay, follow this river to Lake Nipissing, then pass through a number of small lakes to the Ottawa River and down the Ottawa valley to Montreal. There would be twenty-eight miles of canal excavation, sixty-six miles of channel dredging, and 346 miles of lake and river. The plans call for twenty-seven locks of a minimum length of 650 feet, with a clear width of sixty-five feet and a depth of twenty-two. The total fall from the summit, east of Lake Nipissing, to the Saint Lawrence at Montreal is 659 feet. The minimum water supply in the summit basin would permit twenty lockages a day throughout the season of about 210 days.

The canal would shorten the water route from Montreal to Lake Superior ports by 282 miles, and from Montreal to Lake Michigan ports by 270 miles. The cost of this undertaking is estimated at $125,000,000. Before pledging itself to the expenditure of this vast sum, the Dominion government determined to investigate the commercial feasibility of the canal, and in a general way the relation it would have to the transportation problems in Canada. For this purpose the Georgian Bay Canal Commission was appointed in 1914. Its preliminary report appeared in 1916. W.S.E.

GERANIUM, *je ra'ni um,* a hardy, flowering house or garden plant cultivated throughout America and Europe, but originally a native of the Cape of Good Hope. It is a grateful plant, and in almost any soil, with plenty of water, sunshine and but little care will send forth its shrubby, leafy stems and red, pink or white flower clusters from a tin can as readily as from an expensively-prepared bed. In some places, California especially, this ornamental plant grows almost like a little tree. Geraniums are popular for their brilliant flowers and beautifully-marked fragrant foliage. The leaves of the *rose geranium* are especially fragrant and are often used to flavor jellies. The *ivy leaved* geranium, with its trailing habit, shiny leaves and loose flower clusters, is a favorite for window boxes.

A species of wild geranium popularly known as *crane's-bill,* is found wild in parts of the United States, Canada and Europe. It has beautiful leaves and magenta flowers, which do not last long, however, when picked. Its root is used in medicine as a stimulant. The *alfilaria,* common in the Pacific coast region, where it is used for forage, is a genus of geranium.

THE GERANIUM
As a house plant.

The geranium is an ideal winter-flowering plant for the home, since it adapts itself readily to conditions found in the ordinary living-room. If plants are obtained which have not been exhausted by blooming during the summer, that is, whose buds have been removed as they appeared, they will with little care blossom in profusion from January to June. The housewife who sees that her geraniums have a sunny location and enough water to keep them constantly moist at the roots may enjoy her indoor garden throughout the winter months.

WILD GERANIUM

GERARD, *je rard'*, JAMES WATSON (1867-), an American diplomat who was called upon to represent his country in one of the most critical periods of its history. In 1913 he was appointed ambassador to Germany by President Wilson; the following year saw the great powers of Europe engaged in the War of the Nations, in the course of which the relations between Germany and the United States became repeatedly strained as a result of the German submarine policy. Throughout the period when the two nations were attempting to come to an understanding through diplomatic correspondence Gerard carried on his trying duties with a skill and tactfulness that won admiration. In February, 1917, when President Wilson severed diplomatic relations between the two countries he was recalled.

Gerard is a native of Geneseo, N. Y., and a graduate of Columbia University (1900) and Columbia Law School (1902). For three years, from 1908 to 1911, he served as associate justice of the supreme court of New York. He was also active in Democratic politics in his state, having been chairman of the Democratic campaign committee of New York County for several years. In 1914 he was a candidate for United States Senator.

GERIN-LAJOIE, *ger'aN lah zhwa'*, ANTOINE (1824-1882), a Canadian novelist and poet, whose story of *Jean Rivard* is one of the classics of French-Canadian literature. Like many of his contemporary men of letters, Gerin-Lajoie was a barrister by profession, but for many years was either contributor to or editor of several periodicals. He was one of the founders and at one time president of L' Institut Canadien. *Jean Rivard* is his best book, but also noteworthy are *Le Jeune Latour (Young Latour)*, a tragedy, and *Dix Ans d'Histoire du Canada, 1840-1850 (Ten Years of Canadian History)*, a clear analysis of the decade during which responsible government was established in Canada.

GERM, *jurm*, in its broadest sense, the term applied to the earliest stage in the growth of a living organism. For example, the botanist calls the embryo of a seed the germ of the plant, and the sprouting of the seed is known as *germination*. In popular language, the terms *bacteria* and *germs* are used synonymously when reference is made to the minute organism which medical investigators have proved to be producers of disease. See BACTERIA AND BACTERIOLOGY; DISEASE; subhead *Germ Theory of Disease;* subtitle *Diseases of Plants*. W.A.E.

GERMAN EAST AFRICA, the most important and the largest of the German colonies, captured by Great Britain in 1917. The conclusion of the War of the Nations may leave this great colony a German possession, though it may be lost to that country. It is one of the healthiest and most fertile regions in equatorial Africa. It cuts in two the vast British possessions stretching along the eastern half of the continent, and has prevented continuous communication through British territory between Cape Town and Cairo.

Area and Population. The area of German East Africa is estimated at 384,000 square miles, or nearly the size of Germany and France together. It is nearly 20,000 square miles larger than the great Canadian province of Ontario. Its population is estimated at about 7,700,000 inhabitants, of whom only 5,500 are whites.

LOCATION MAP

Description and Resources. The coast, which is 620 miles long, is low and flat, but most of the interior is a table-land situated at an altitude of 3,000 to 4,000 feet. South and east of this table-land are several chains of mountains. In the north-eastern corner of the colony rises the volcanic peak of Kilimanjaro, 19,720 feet, which is the highest point in Africa. The rivers are not navigable.

Agriculture and cattle raising form the chief occupation of the inhabitants. Millet, wheat, cotton, tobacco, copra, rice, coffee, tea and sugar cane are grown. Rubber is collected in increasing quantities. These together with ivory constitute the chief exports. Coal, iron, copper and salt have been found.

The capital and chief seaport is Dar-es-Salaam, which is connected with Ujiji on Lake Tanganyika, a distance of 743 miles, by a railway which traverses the colony from east to west. There is another railway running from Tanga on the coast to the foot of Kilimanjaro, a distance of 220 miles.

History. German colonization started here in 1884, and the boundaries of the colony were fixed by treaties concluded with England, Belgium and Portugal in 1890. A serious upris-

ing of the natives that took place in 1905 was soon crushed, but it had the effect of making the German authorities improve their treatment of the natives. During the War of the Nations, begun in 1914, English and French

TYPE OF NATIVE VILLAGE
German East Africa.

troops invaded the colony and fought several engagements with the German forces, but without any decisive result. In the early part of 1916 the English started a strong offensive and easily captured the colony. O.B.

GERMAN LANGUAGE, one of the great languages of the world, spoken by about 80,000,000 people. Within the German Empire over ninety per cent of the inhabitants use some form of German speech, while in Austria-Hungary and in Switzerland there are millions of German-speaking people. To those unacquainted with it, German is not a musical language, owing to its guttural sounds, and those who are accustomed only to English find it difficult to master German because of its very different sentence order, its inflections and its custom of building compound words by merely joining together simple ones. The very characteristic tendency to place some verb form at or near the close of the sentence Mark Twain described in the words, "The German dives into the Atlantic of his sentence and comes up on the other side with a verb in his mouth." As for the custom of word-building, those who speak other tongues may well be envious, for in German it is possible to express in one adjective an idea for which another language would have to make use of cumbersome phrases and clauses. What other language, for instance, could achieve such a triumph as "the with-great-pleasure-a-large-red-apple-eating child"?

German is much more nearly phonetic than is English; that is, it has fewer silent letters and fewer variations in the sounds of letters. If a learner has mastered thoroughly the sound-value of every German vowel, consonant and diphthong, he need not fear to pronounce any word he sees, for it is almost certain to be sounded just as it is written. Especially rich in synonyms, German affords opportunity for most exquisite effects in word-choice, and no language better fulfils the demands of the orator and the poet.

Historical. The term *German* includes two branches, the High German and the Low German, but only the former is considered here, the latter having special treatment under the heading PLATTDEUTSCH. The growth of the German language has been a gradual development through three periods, the Old High German (700-1100), Middle High German (1100-1500) and Modern German, from 1500 to the present time. In the earlier periods each section of the country spoke a different dialect and no attempt was made at unifying, but when German became the official language of the imperial court the particular dialect spoken there came to be looked upon as superior to the others. Its use spread in official circles, and by the beginning of the Modern German period this one branch was so much more commonly understood than any other that it was the natural one for Luther to use when he came to translate the Bible. Frequently it is stated that Luther gave to the German language its literary form, but this is not true. It had practically crystallized before his time, but he helped very decidedly to widen the knowledge of it. Every German who wanted to read his Bible had to know the particular dialect in which it was written.

To-day there are numerous dialects in German, as there are in any language spoken by a very large number of people, but the language of books is the same wherever German is used. A.MC C.

GERMAN LITERATURE. As English literature runs back into the old Anglo-Saxon, so German grew gradually out of the medieval Gothic, and at approximately the same period; but distinguished names do not appear in the history of German literature nearly as early as in the English. The three greatest writers England has produced—Shakespeare, Milton and Chaucer—all lived early in her literary history, but Germany had before the beginning of the eighteenth century only one author

of first rank, and that was Martin Luther. Though German literary achievement has thus been crowded into a comparatively brief period, it is worthy to rank with that of any other great nation. No scholars are more profound than those of Germany, and from no other country have so many systems of philosophy been issued; no poets are more exquisitely lyrical than the Germans, and German songs are sung the world over; while in Goethe, Germany has one master who stands with the few dominant literary figures of the world.

Early Period. As in most countries, literature began in Germany with the songs of the minstrels, the *sagas* of great heroes. These were written, or sung, rather, in various dialects and were merely local in their appeal, for Germany was not in those early times a nation, but a group of little, warring states. But a national feeling was being born, and every emperor who did anything to unite the severed states or to increase German power at the expense of some other country was helping to give it life. And with the birth of a national spirit there came into being in the early thirteenth century the great national epic, the *Nibelungenlied* (which see). This was not the product of a single poet or a single time, but was woven of the ballads and folk tales of innumerable minstrels of the centuries that were past. The spirit of the Crusades was abroad, and the love of chivalry was voiced by the German *Minnesingers*, who correspond in a measure to the *troubadours* of France (see MINNESINGER; TROUBADOUR).

In time this first spontaneous outburst of song died away, and poetry became more stilted and artificial. The *Meistersingers* took the place of the *Minnesingers*, and the commercial spirit of the times made itself felt even through the poetry.

The Reformation Period. An upheaval was preparing which should both startle men's minds into keenness and banish artificiality—the great Protestant Reformation. Luther is the commanding figure of this period in its literature as in its history, and his translation of the Bible was the one truly great work handed down by it to later times. Of literature in the sense of easy and graceful tales or serious writing there was practically none; everybody was interested in some phase of the Reformation and cared more to advance his cause than to produce matter that was formally correct. Even the chief poet of the era, the picturesque Meistersinger, Hans Sachs, sounded the aggressive spiritual note in his songs. From the close of the Reformation period to the beginning of the eighteenth century little that was noteworthy was produced. The Thirty Years' War exhausted the country so completely that the people had no heart for literature.

From the Eighteenth Century to the Present. It seems little short of marvelous to turn from such dearth of literary accomplishment to the richness of this later period. As the country recovered from the disastrous effects of the Thirty Years' War a new feeling of nationality began to awaken, and this was intensified by Frederick the Great and his achievements in the Seven Years' War. This powerful ruler gave no special encouragement to German literature, but it grew up about him and actually helped him in his work of building up a real Germany, with Prussia as a center. The technique of poetry improved much in the hands of Klopstock, the first master of the modern German lyric; the new spirit of freedom and expansion found expression in Wieland; German drama rose to fresh heights with the production of Lessing's great plays; and almost every field of German thought felt the influence of Herder.

But the real Golden Age of German letters was yet to come, though it was near at hand; for Goethe and Schiller were born near the middle of the eighteenth century, and with them German literature reached its great height (see GOETHE; SCHILLER). Few nations can present so perfect a type of the universal genius as was Goethe, and his influence is still felt in every literature of Europe. Contemporaneous with the great two, or slightly later, was a group of men distinguished in every field. Kant, Fichte, Schelling, Uhland, Jacob and Wilhelm Grimm—those were but a few of the names that made the era illustrious. As in France, Romanticism had its day, with Jean Paul Richter at the head of the movement, and though its excessive emphasis on idealism and fantastic imagination defeated its own purposes and brought about its decline, it had succeeded in modifying permanently the formal classicism.

In the period following that of Goethe the most important figure in German literature was Heine, influential in many departments, but supreme in that of lyric poetry. The second quarter of the nineteenth century was a time of political and social unrest in Germany, and much of the literature produced, whether it

was poetry, fiction or drama, had some cause to advance. Since the establishment of the German Empire in 1871 as one of the great powers of Europe, literary development has been steady, and in any list of writers of high rank a number of Germans would have to be mentioned. To enumerate these is impossible here, but any treatment of German literature would be incomplete without the mention of the two great present-day dramatists, Sudermann and Hauptmann. Literature suffered in Germany by reason of the War of the Nations, which engulfed Europe in 1914, as it did in other countries engaged therein, but out of Germany there came the poem which critics agree in calling the one really great expression of the war spirit—Lissauer's *Hymn of Hate*. Its author afterward apologized for its bitter feeling, and the German government disavowed its attitude, but from a literary point of view it stands unequaled by the multitude of other poems called forth by the great struggle.

Each great writer named in this article is referred to at length elsewhere in these volumes. A.MC C.

GERMAN SILVER. Much of the so-called silverware used on the table consists of a yellowish metal that has been coated or plated with silver. When new, this ware has the appearance of solid silver, but the plate wears off by use and the yellow metal is revealed. This metal is an alloy of copper, nickel and zinc, in proportions of two parts copper to one part nickel and one part zinc, and is known on the market as *German silver,* or *nickel silver.* The proportions of copper and nickel vary to adapt the alloy to different purposes. When designed for making casts and candlesticks, a little lead is added. The addition of iron or steel makes the alloy harder, whiter and more brittle. German silver is harder than silver and takes a good polish, but it is easily tarnished. Vinegar and strong solutions containing salt form poisonous compounds with it, and tableware from which the silver has been worn away should not be used with such liquids or with fruit.

GERMAN SOUTHWEST AFRICA, until 1915 a German colony, situated on the southwestern coast of Africa, bordered south and east by the Union of South Africa and Rhodesia, north by Portuguese West Africa and west by the Atlantic Ocean. In the year named, the first year of the War of the Nations, the English conquered the territory and named it Southwest Africa Protectorate. Its fate at the conclusion of the war could not be foretold in 1917, but English statesmen declared it should not be returned to Germany.

LOCATION MAP

Nearly at the middle of its coast line, which is 950 miles long, is the port of Walfish Bay, which with the adjoining territory had always belonged to Great Britain. Its area is estimated at 322,000 square miles, or more than one and one-half times that of the whole of Germany or France. The size of this colony is equal to the combined area of the states of Ohio, Indiana, Illinois, Michigan, Wisconsin and Minnesota. It has only 30,000 square miles less than the great Canadian province of British Columbia. The population is estimated at about 80,000 natives and 15,000 Europeans.

Description and Resources. The coastal zone, extending inland about sixty miles, is sandy and barren, and is bordered by a wide belt of highlands, which rise gradually to an altitude of 3,000 to 6,000 feet. The eastern part of the colony is a sandy desert and forms part of the great Kalahari Desert, which stretches through the northern part of Cape Colony to the borders of the Transvaal and Rhodesia. The capital is Windhoek, situated in the interior and connected by railroad with Swakopmund, on the coast, where a harbor has been built. Another railroad starts at the seaport of Angra Pequena, or Lüderitz Bay, and goes to Kalkfontein, at the border of Cape Colony. This line was linked up with the railways of the Union of South Africa by the building of a railroad from Prieska in Cape Colony to Kalkfontein. This railroad, 314 miles long, was built in connection with and during the military operations undertaken by the British in 1914-1915.

Sheep and cattle raising constitutes the chief source of wealth of the inhabitants. Copper is mined, and since 1908 large quantities of diamonds are extracted in the neighborhood of Lüderitz Bay. Gold and other minerals have also been found. The chief exports consist of wool, hides, horses, ivory, ostrich feathers, copper ore and diamonds.

History. Germany began to take possession of this region in 1884. The boundaries of the colony were fixed by treaty with England and Portugal in 1890. In 1903 a Hottentot tribe revolted, and in the following year the powerful Herero nation rose in rebellion. This revolt was only subdued after three years of very stubborn fighting.

Shortly after the outbreak of the War of the Nations in 1914 British troops under General Louis Botha invaded this German possession. After a campaign characterized alike by boldness of conception and rapidity of execution, Botha conquered one after another the chief points of the colony. On May 12, 1915, he hoisted the British flag over Windhoek, the capital, and on July 9, 1915, the German authorities were finally compelled to surrender the colony to the British. O.B.

GERMANTOWN, Battle of, an important engagement of the Revolutionary War in America, on October 4, 1777, between the Americans under Washington and the British under Howe. Washington opened hostilities at daybreak and was at first successful, but in a dense fog one American column mistook another for the enemy and opened fire upon it. The American troops were thrown into confusion, and a general retreat followed. Washington's courage in attacking the British so soon after the defeat at Brandywine led the hitherto undecided French court to form an alliance with the United States, and this fact gives to Germantown its historic importance.

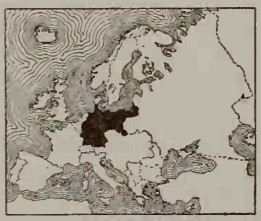
Germantown, the village where the battle was fought, was a former suburb of Philadelphia, but since 1845 has been included within the city limits. It was settled in 1683 by a party of Germans. The first paper mill in America was erected there in 1690, and in the little town in 1743, the first American edition of the Bible was printed. Its picturesque location, fine architecture, and beautiful parks make it a desirable residence place.

GERMANY, or more accurately speaking, the German Empire, is a state of Central Europe, one of the most important countries of the continent. As a state it is, in its present form, very young—younger even than the United States; but the beginnings of its history go far, far back, and no phase in the life of Europe is more interesting than the tracing of Germany's growth in size, in power and in national consciousness. The name to-day is likely to recall thoughts of the War of the Nations, in which Germany ranged itself, in 1914, with comparatively weak Austria, against a dozen powers, and interest in Germany and its affairs is consequently keener than ever before. The facts which are related in this article must refer in large measure to Germany as it was just before the War of the Nations. From the outbreak of that struggle there was about the country such a wall of steel that practically no reliable information as to internal conditions reached other peoples.

What Germany Comprises. The German Empire is not, like Russia, a unit, with divisions merely for purposes of local government; nor is it, like the United States, a union of commonwealths of equal rank and with equal powers and privileges. It is made up of kingdoms, grand duchies, duchies, principalities and free cities—twenty-six states in all; and the distribution of rights and privileges is a rather complicated matter and can be understood only in connection with the history of the country. For every complexity, no matter how strange it may seem at first sight, has its explanation in some crisis in the growth of the state.

Germany has in some ways a peculiarly favorable location, for it is in close connection with most of the great states of Europe. On the east are Russia and Austria-Hungary; on the south Austria-Hungary and Switzerland; on the west, France, Belgium and Holland; and on the north the North Sea, Denmark and the Baltic Sea. Germany lies between latitudes

47° 16′ and 55° 53′ north, and thus occupies approximately the same north and south position as Newfoundland and Labrador, but other conditions differ so that a traveler would not suspect this similarity.



LOCATION MAP

Interesting Measurements. The total area of Germany is 208,825 square miles—slightly greater than that of the Canadian province of Yukon, or of the combined states of Colorado and Wyoming. Among the states of Europe it is third in size, only Russia and Austria-Hungary surpassing it, though its hereditary enemy, France, almost equals it; while its population in 1911 of 64,925,993 made it second only to Russia among the European countries. It is a very irregular country, with a compact western portion and widely extended easterly provinces, so that its greatest dimension by far is from southwest to northeast. In this direction one may travel in a straight line in Germany more than 800 miles, or farther than from Chicago to Washington, D. C.

About one-third of the whole border line of Germany, or 1,200 miles, is sea coast. See below, the subtitle *Physical Features.*

The People. The Germans, or as they call themselves, *Deutsche,* are Teutons—that is, they belong to that great division of the human race which includes the Scandinavians, the English, the Dutch and most of the inhabitants of Canada and the United States. The typical German has fair hair and blue eyes, and is rather solidly built; but it is estimated that less than one-third of the inhabitants of the Empire are of this type, by far the greater number belonging to an intermediate brown-haired type.

Temperamentally the Germans have certain very distinct characteristics. Perhaps the chief of these is thoroughness. Without the quickness of the French or the bulldog determination of the English, the German accomplishes results by a stolid perseverance which ignores all obstacles. "German stolidity" has become proverbial, but the term stolidity is by no means uncomplimentary, for no people has delved deeper and more effectively into philosophy; no people has wrought out more painstaking and accurate scientific systems, or has produced literature, whether of the realistic or the imaginative type, of more lasting importance.

All the inhabitants of the United States may be called, in a certain sense, Americans; all those of the Dominion, Canadians, but all the inhabitants of the German Empire are not in this same sense Germans. These non-Germans are not immigrants who dwell in the country without becoming a part of it, but are people living on their ancestral soil and who speak the language which their predecessors have spoken for centuries. Thus there are Poles in the provinces of Silesia and Posen; Danes in Schleswig-Holstein; French in Alsace-Lorraine; Czechs in Silesia—in all, a population of over 4,000,000 of non-German blood. These various peoples, on land which did not always belong to Germany, speak their own tongues, but for the most part German prevails. All Germans, however, do not speak exactly the same language or dialect. In the northern, or lowland district, there is the so-called Low German, or *Plattdeutsch,* while in the highlands of the south, High German is spoken. This latter is the language of German literature, and is making its way little by little into the territories which once knew only Plattdeutsch (see GERMAN LANGUAGE; PLATTDEUTSCH).

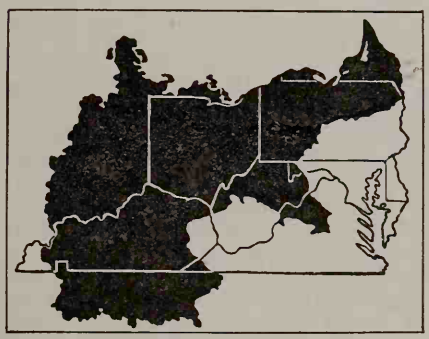
With its total population of 64,925,993 before the War of the Nations, Germany had a density of 310.9 to the square mile—considerably less than England, Belgium or the Netherlands, and about ten times that of the United States as a whole. The distribution of the inhabitants is very uneven, for one kingdom of the Empire, Saxony, has about 800 to the square mile. Considerably more than half of the people live under urban conditions, that is, in communes of more than 2,000 inhabitants. There are twenty-four cities each with a population greater than 200,000, and the total number of those with more than 100,000 is forty-eight. The chief cities, most of which receive detailed description in separate articles in these volumes, are Berlin, the capital; Hamburg, Leipzig, Munich, Dresden, Cologne, Breslau, Frankfort-on-the-Main, Nuremberg, Hanover, Stuttgart and Bremen.

The Germans have a much stronger tendency to emigrate than have the French, for example, and it is estimated that during the nineteenth century no fewer than 6,000,000 people left their ancestral homes. By far the larger number of these chose the United States as their foster-country.

Physical Features

The Surface. Germany has two sharply-contrasted surface regions—a northern lowland and a central and southern highland, the latter occupying about two-thirds of the country. The lowland is a part of the great plain of Northern Asia and Europe, and stretches from the borders of Russia to those of Holland. For the most part this plain is level, but there are several elevated tracts which attain in places heights of 1,000 feet or more. Sloping to the north and northwest, to the shores of the North and the Baltic seas, this plain ends in the low-lying coastal flats, with sand dunes and infrequent harbors. Only where a river, as the Elbe or the Weser, finds its way to the sea are their channels wide enough and deep enough for good ports.

The highland region is much less uniform; indeed, it may be divided into two well-marked sections. In the southeast is the Alpine country, with its spurs or ridges branching out from Switzerland. Here, in Bavaria, is found the highest altitude in Germany, the Zug



COMPARATIVE AREAS

The area of Germany covers 208,825 square miles. It is but little larger than the American states of Ohio, Kentucky, Virginia, West Virginia, Pennsylvania, Maryland and Delaware, a compact group whose combined area is 208,258 square miles. Compared with the Canadian province of Alberta, Germany is nearly 50,000 square miles smaller.

Spitze, which has an elevation of 9,738 feet. North and west of this limited Alpine district are the highlands proper, a greatly diversified region with high, fertile plains, rolling, hilly sections and numerous scattered mountain ranges with rounded summits, few of which exceed 3,500 feet in height. Of these mountains the most important are the Riesen-Gebirge, or Giant Mountains, the Vosges, the Erzgebirge, or Ore Mountains, so called from the copper, iron, silver and other ores which they contain, the Schwarzwald, or Black Forest, about which center so many traditions, and most famous of all, the Harz Mountains, with their culminating peak, the Brocken, which stands shrouded in mist, fairly inviting the wierd and gloomy legends which cluster about it.

One of the very interesting points in the study of history is the relation which it bears to the geography of a country, and this is strikingly shown in the case of Germany. Had there been no branching mountains, acting as natural barriers and separating the territory into numerous high plains and valleys, inviting century upon century of warfare, separate states might never have been, for with freer intercourse a single nation might have developed far earlier.

Rivers and Lakes. Germany is rich in rivers, having within its borders about 6,000 miles of navigable natural waterways. The central highland region acts as a "great divide," separating the rivers that flow into the North and Baltic seas from those that flow into the Black Sea. Of the latter there is but one of importance, the great Danube, which rises in the Black Forest and drains the greater part of Bavaria. The chief rivers which empty into the North Sea are the Rhine, the most important river of the empire, though it has neither its source nor its mouth within Germany; the Ems; the Weser, with its great port of Bremen; and the Elbe, on which is situated Hamburg, the chief port of the country; while those flowing into the Baltic are the Oder, which, like the Weser, is entirely in German territory; and the Vistula, which is chiefly a Russian river and carries down to the sea not only the drainage, but a large portion of the commerce of Russia. Certain tributaries of these larger rivers, as the Main, the Moselle and the Saale, are also of considerable importance.

One of the lake regions of Germany is in the Alpine district in the southeast, where the glaciers of bygone ages carved deep basins in the rocks. These mountain lakes have the clear, cold water and the same picturesque surroundings which have made the Swiss lakes the most famous in the world. Scattered about the northern plain are numerous shallow lakes—no fewer than 500 in all; but these, with their low, swampy shores, have no particular beauty

or importance. The rivers which flow into the Baltic empty into curious land-locked bays, called *haffs,* very shallow and ringed with sand dunes. The largest of these, the Kurisches Haff, into which the Memel empties, has an area of 626 square miles.

Climate and Life Forms. Though Germany extends through almost nine degrees of latitude there is comparatively little variation in temperature between the north and the south, because the high altitude makes the south cooler than it might otherwise be, while the sea breezes have just the opposite effect on the northern portion. Thus in the south the average annual temperature is about 52°, while in the north it is about 48°. The variation east and west is more marked, the inland region to the east having a distinctly continental climate, with extremes of heat and cold, while in the west the summers are not so hot nor the winters so cold. The rivers flowing into the Baltic are obstructed by ice for considerable periods each winter, but those flowing to the North Sea are seldom frozen over, except the Elbe, the easternmost of the North Sea rivers.

As to rainfall, there is almost everywhere enough for agriculture, but the distribution is very uneven. It is heaviest in the Harz Mountains, which average over forty inches each year and in some parts have no less than sixty inches; but most of the mountain and western coast regions have from twenty-five to thirty inches.

In the very olden days Germany was a heavily forested country, and many of the old myths and superstitions are connected with trees. Germany has not been as wasteful of its forests as some other countries, for to-day about one-fourth of the entire surface is wooded, and forestry is well advanced. That this is true even the children may know, from the frequent allusions to foresters in their fairy tales. So thickly overgrown are some of the mountain ranges that they are called not *mountains* but *woods,* as Schwarzwald, or Teutoburg Forest. About two-thirds of the trees are cone-bearers—pines and firs; and the rest are chiefly oaks, beeches and birches.

The animal life is in some ways very interesting, for in the Southern Alps and in the Harz Mountains are to be found foxes and wildcats, while wild boars and deer still roam many of the dense forests. Birds are numerous, but most of them are but transients, for two of the great migration routes cross the Empire (see BIRD, subtitle *Migration of Birds*).

Resources and Industries

Mineral Wealth. Germany is one of the richest in minerals of all the European countries, and its chief products are those two basic minerals, coal and iron. Only the United States and Great Britain among the countries of the world produce more coal and only the United States more iron. Westphalia, Silesia and the Rhine Province yield most of the coal, about ninety per cent of the annual output of 190,000,000 tons, in normal times. This is exclusive of lignite, of which more than one-third of the above amount is produced. As yet no limit can be seen to the coal stores of Germany, though some of the richest mines have been worked for five or six centuries.

The production of iron increased rapidly during the late nineteenth and the early twentieth century, the output of pig iron amounting in recent years to almost 20,000,000 tons annually. In its yield of silver, too, Germany ranks first among the European countries, and copper, zinc, lead and nickel are mined in considerable quantities. There are vast deposits of salt and of various potash compounds, and to these latter is due in large measure the growth in the chemical industries. All along the Baltic coast amber of excellent quality has been obtained for fully two thousand years.

"Made in Germany." Without its mineral wealth Germany could not have had in recent years its marvelous industrial development—a development greater than that of any other country within the same period. In the value of its manufactures it has passed France, long its rival, and in 1913 was surpassed only by Great Britain and the United States. The "Made in Germany" legend stamped on goods of various sorts has become familiar in all parts of the world, and on almost all wares is a guarantee of quality. The oldest and most important of the industries are the textile manufactures, whether cotton, linen, woolen or silk. Much of the raw cotton and wool is imported, but the high valleys of Silesia, Saxony, Westphalia, the Harz and other districts are in the season blue with the spreading fields of flax. Dress goods, clothing, damasks, carpets, thread laces and shawls are produced in great quantities, and most of the manufactures are rather sharply localized.

The metal industries in all their branches of steel and iron rolling, the making of machinery and the manufacture of hardware and instruments have experienced the largest growth. The products of the great Krupp gun works, which employ scores of thousands of workers, are too famous, especially since 1914, to need mention, but in many kinds of smaller metal goods, as cutlery, tools and instruments, the Germans have long enjoyed an equal superiority. Their scientific instruments, in particular, are considered the most accurate in the world. Beet sugar, of which more is produced than in any other country; beer, of which an average of twenty-two gallons to each person is consumed annually in the empire; chemicals; great ships; toys, clocks and carved woodenware—in the making of all of these Germany excels. The statement made at the opening of this article may be emphasized here: all these facts refer to Germany before the outbreak of the great war in 1914, for every phase of its life has been immeasurably changed since then.

An interesting feature of the industrial life of Germany is the compulsory insurance by which workers are made safe against loss of income through sickness, old age or accident. Part of the fee—a very small part—is paid by the person insured; the remainder is shared between the employer and the government. Since almost one-half of the population derive their living from the manufacturing industries, it may be seen that this is a provision of great importance.

Agriculture. Time was when Germany raised practically all the foodstuffs it needed, but in recent years, since many have turned to industrial life and less than a third of the population is engaged in agriculture, much food must be imported. About one-half the entire land surface is actually under tillage, and of this area a large part is divided into very small farms, millions of these being less than five acres in extent. But the German farmer is painstaking and intelligent, and by the use of modern methods and machinery he wrests from the soil, in some places none too fertile, a fair living. The least fertile portions of the country are in the north and northeast.

Crops are widely varied, but in the empire as a whole cereals, potatoes and hay predominate. Of the cereals, rye is the most important, and rye bread is as distinctly the staple food of the poorer people of Germany as is wheat bread in Canada and the United States. Over a million acres are under sugar beets, which form the prevailing crop of North Germany, while in the south and west, especially in the valleys of the Rhine, Main, Moselle and Neckar, the vine is the most characteristic growth, Rhine wines being famous throughout the world. Flax in the central region, hops, corn and fruits in the south, and almost everywhere wheat, barley, rye and oats—these are the outstanding crops. The government has done much to encourage agriculture, and a spirit of intelligent coöperation among the farmers themselves has worked for progress.

Stock raising is of considerable importance, for Germany has much partially drained marsh land with a rich growth of grass. Of the domestic animals swine are the most numerous and cattle the next, the number of sheep in the empire having declined three-fourths within the last three decades. The government interests itself in the raising of good breeds of horses.

Transportation and Commerce. With its 6,000 miles of naturally navigable rivers, 1,400 miles of canalized rivers, and 1,500 miles of canals, Germany has an abundance of waterways. Some of the canals are famous, notably the Kaiser Wilhelm Canal across the peninsula of Jutland, which connects the Baltic with the North Sea. See Kaiser Wilhelm Canal. The empire is not dependent for transportation upon waterways alone, for it has one of the largest and most complete railway systems in the world. Only Russia and the United States, far vaster in extent, exceed Germany's total of more than 39,000 miles, and only Great Britain surpasses it in the length of railway compared with its area. Berlin is the chief railway center. Over ninety-two per cent of the railway mileage is in the hands of the state governments, each state controlling the lines which have the greater part of their course within it.

Commerce. No other country except Great Britain had so large a foreign trade as had Germany up to August, 1914. The remarkable industrial development brought about a corresponding commercial growth, and in recent years the total foreign commerce has been about $4,600,000,000. Of this amount the imports make up somewhat more than half, and in this Germany differs from the United States, which exports more than it receives. Fully one-half of the imports are raw materials for its factories, and one-third consist in foodstuffs, while the exports are largely manufactured goods—textiles, metal products, chemi-

cals, certain made foods, toys and small wares. The United States, Great Britain, Russia and Austria-Hungary have been for years the countries with which Germany has carried on the largest trade, Russia ranking first in the amount imported into Germany, and England being the largest receiver of exports. The growth of the trade with the United States has been a significant feature of the past two decades. Cotton, copper, lard and wheat are the most important articles supplied by the United States to Germany, but Russia supplies the larger part of the wheat. What the condition will be for years after the war it is impossible to forecast.

There has been no customs union since 1871, as the customs rights of the state went over to the empire.

Social and Political Conditions

Education. The very first rank in educational matters is generally conceded to Germany, whether reference be had to the development of the highest arts and sciences, or to the general spread of ordinary education. Different indeed would be the history of education if the names of German educators were omitted. There are practically no illiterates in Germany, only two out of ten thousand of the military and naval recruits being unable to read and write. The compulsory education law, which provides that every child between the ages of six and fourteen must attend school throughout the whole school year, is rigidly enforced.

This entire compulsory period may be spent in the "folk schools" as they are called, and these are free. Children who intend to go beyond these primary schools, however, do not take the whole eight-year course in them, but are transferred, after they have learned the rudiments, to higher schools; while those who continue in the folk schools rarely go to any other unless it be the "continuation schools" which fit them for trades.

Many of the secondary schools have special preparatory schools in connection with them, and in these, as in the secondary schools themselves, fees are charged. The most famous type of these secondary schools is the *gymnasium,* a school which places chief emphasis on the classics. There are also the more modern *realschule,* which stresses mathematics, science and the modern languages, but includes Latin; and the *oberrealschule,* which rules out the classics altogether; and in recent years there has grown up a combination type which has the advantage of making it unnecessary, as heretofore, to settle upon a boy's career when he is but nine years old. These schools are for boys only, since until recent years the state has paid little attention to the higher education of girls, leaving that to private institutions. To-day, however, there are three kinds of girls' schools which correspond to the three types described above.

Of universities Germany has no fewer than twenty-one, some of them among the most famous in the world—great schools to which students flock from all over the world to obtain those degrees which always bestow more prestige than degrees gained elsewhere. The largest universities are those of Berlin, Munich and Leipzig, but those of Bonn, Göttingen, Freiburg, Halle, Heidelberg, Würzburg and Jena are no less celebrated.

Germany has been a pioneer in the establishment of vocational schools, especially of those which are but part-time schools, open to young people who must spend the greater part of their time at work. There are also commercial schools and famous technical schools where a man may learn to be an engineer, a forester, a worker in metals, a shipbuilder, an architect—almost anything, in fact, toward which he feels a particular inclination.

The school systems are under state and not imperial control, each state acting independently and making up out of its treasury about half the necessary funds, the rest being supplied by local taxation.

Religion. There is no imperial religion, and in general it may be said that freedom of worship prevails, though certain of the states have what are in effect state religions. In this country, which was the birthplace of the Reformation, the Protestant or Evangelical faith predominates, claiming about sixty-one per cent of the population, while the Catholics have but thirty-six. There is a rather sharp territorial division, some states being largely Evangelical, some Catholic; the distribution, interestingly enough, is very similar to what it was in the earliest days of Protestantism, four centuries ago.

There are within the empire over 600,000 Jews, and in some states their religion receives state support, as do the Christian faiths.

Government

This is a rather complicated matter, but its main features may be sketched very simply. The twenty-six states which make up the empire are as follows: four kingdoms—Prussia, Bavaria, Saxony and Württemberg; six grand duchies—Baden, Hesse, Mecklenburg-Schwerin, Mecklenburg-Strelitz, Oldenburg and Saxe-Weimar; five duchies—Anhalt, Brunswick, Saxe-Altenburg, Saxe-Coburg-Gotha and Saxe-Meiningen; seven principalities — Waldeck, Lippe, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, Reuss-Schleiz, Reuss-Greiz and Schaumburg-Lippe; three free cities—Hamburg, Lübeck and Bremen; and one imperial province, Alsace-Lorraine, taken from France at the close of the Franco-German War in 1871. Of this great federation of states, which is governed under the constitution dating from April 16, 1871, the king of Prussia has the title of German emperor. Some of the states, as noted in the early paragraphs of this article, have special privileges; Prussia, as the strongest, simply assumed the rights it desired, and certain others, as Bavaria and Baden, exacted theirs before they would consent to enter the federation. All, however, entered voluntarily.

The Emperor. As king of Prussia the emperor has certain duties and responsibilities, but these are distinct from those which he assumed when he became German emperor. He summons, opens and closes the federal legislative bodies, but has no veto power over their acts; he appoints and dismisses all the officers in the imperial service, including the chancellor; represents the empire in international affairs; is commander-in-chief of the army and navy and may on his own initiative declare defensive war; but in order to engage in offensive war he must have the approval of the federal council (see below). As the chief executive officer he deals not with the states themselves, but with their sovereigns, for the states execute practically all the imperial laws at their own expense.

The Chancellor. Since the emperor may not be held responsible for what he does, practically all his official acts must be signed by a minister known as the imperial chancellor, who is appointed and dismissed at the will of the emperor. This officer is also prime minister of Prussia. He is president of the *Bundesrat,* or Federal Council, and has a seat in the *Reichstag,* or lower house, but he is responsible, not to either branch of the legislature, but solely to the emperor; for the government of the empire is not parliamentary in the same sense as that of Great Britain. Therefore the chancellor does not resign if his measures are defeated, as does the prime minister of England, but may request the emperor to dissolve the Reichstag and order a new election. Under the emperor he has charge of the execution of the laws of the empire, and he has as his assistants and subordinates thirteen secretaries, each of whom is at the head of a department of government.

The Legislature. There are two legislative bodies, the Federal Council, or *Bundesrat,* and the *Reichstag,* or Parliament, the former representing the different states, the latter the empire as a whole. In fact, the Council is but a body of ambassadors, sixty-one in number, sent by the individual states and voting exactly as they have been instructed by their governments. Any vote cast without such instructions, or contrary to them, is not counted.

THE GERMAN CROWN PRINCE

Frederick William, eldest son of Emperor William II.

(For portrait of Emperor William, see WILLIAM II.)

The really representative branch of the legislature is the Reichstag, which is made up of 397 members, chosen for a term of five years by the vote of all male citizens twenty-five years of age or over. About three-fifths of the members are from Prussia, which has

also leading influence in the Federal Council. Both bodies must be summoned by the emperor once a year. Practically all important measures originate in the Council, but they must have the approval of the Reichstag before they become laws.

The Judiciary. For this, little or no provision is contained in the constitution of the empire, practically all of the courts being established by statute, except the Federal Council referred to above, which settles disputes between states. The present system of courts was created in 1877; it includes district courts, in which petty cases are tried; territorial courts, which hear more serious civil and criminal cases and act as courts of appeal for the district courts; superior courts, which try only cases appealed from the territorial courts; and an imperial tribunal, which stands at the head of the system. This great court, which is located at Leipzig, has over ninety judges, who are appointed for life by the emperor upon nomination by the Federal Council. It is the court of final appeal, but has original jurisdiction in cases of high treason.

Local Affairs. With these the imperial government has little to do, as they are chiefly administered by the states. All the states contribute toward the support of the federal government, but much of what they pay comes back to them as their share of the excise and customs revenues. If there is any conflict between imperial and state laws, it is the latter which must be amended.

Colonies. Germany's colonial policy dates from 1884, and was inaugurated by Bismarck. At the opening of the War of the Nations in 1914 the total area of German colonies was 1,140,115 square miles, distributed as follows:

COLONIES	AREA
Togoland	33,668
Kamerun	305,019
German Southwest Africa	322,432
German East Africa	384,170
New Guinea	92,664
Caroline Islands	956
Samoa	993
Kiao-chau	213
Total	1,140,115

Before the beginning of 1916 there had been lost of the above German Southwest Africa, German East Africa, the Caroline Islands and Kiao-chau. For the colonies remaining the imperial government at Berlin makes all the laws and provides all the officers.

History of Germany

Its Beginnings. Almost more than that of any other nation, the history of Germany has been one of wars. At almost any point where the student takes it up, the clash of arms may be heard, for the German nation, as a nation, has been long in the making and every step has been gained by conquest. It was as a fearless, warlike people that the Romans first knew these dwellers on their northern borders, and the first definite fact in their history was their defeat of the Roman consul Papirius in 113 B.C. Eleven years later the great general Marius administered in turn a defeat to these Teutones, as they were called, for the term *Germans* was a later name, probably formed by the Romans from some Gallic word.

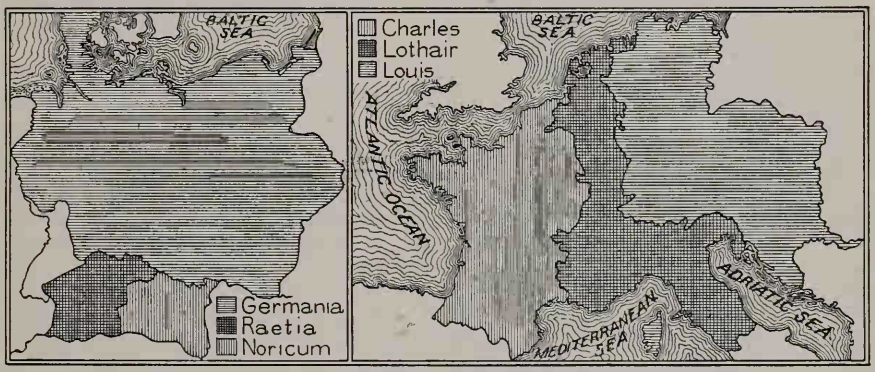
It was Julius Caesar who during his campaigns in Gaul gave to the Roman world the first definite information about some of the barbaric tribes beyond the Rhine—those tall, fair-haired strangers who feared not even the Roman legions. Nominally, Caesar brought Germany under Roman sway, and in the days of Augustus an attempt was made to convert this nominal subjugation into a real one by introducing Roman customs. The effect was disastrous, however, because in A.D. 9 the Germans under Arminius won a complete victory over the Roman legions in a battle which ranks among the decisive ones of the world, for it made it certain that Germany should be Teutonic and not Latin (see FIFTEEN DECISIVE BATTLES). Later expeditions were dispatched to the country, but the Romans never again gained a hold on it, while they, on the other hand, were forced constantly to defend themselves against the invasions of various German tribes—the Alemanni, the Franks, the Goths, Vandals and Lombards.

A Troubled Time. For centuries nothing is known of the internal history of these warring, shifting tribes, which were in no sense a nation. When France, under Clovis, became a state, more and more of the German tribes became assimilated therewith, and in this period the history of Germany is identical with that of France (see FRANCE, subhead *History*). Charlemagne's great empire included Germany as far to the north and east as the Elbe, and was in fact more German than French. In 843,

with the Treaty of Verdun, which assigned to Charlemagne's grandson Louis the eastern part of the empire, the separate existence of Germany really began. From that date France and Germany, in their earlier stages united, have grown farther and farther apart, and rarely has there been a time when perfect friendliness has existed between them.

The newly-established German state had to fight for its very existence, first with the Moravians who set up a strong kingdom in the territory which still bears their name, then with the invading Magyars, or Hungarians. These Magyars, who had swept westward from Northern Asia, Arnulf, the German king, had him as the kingly judge in Wagner's *Lohengrin*.

Otto I therefore succeeded in 936 to a fairly united state, which he proved strong enough to hold together. He defeated the Hungarians so decisively that they never again attempted to invade the west, still further restricted the power of the nobles, and conquered Lombardy, placing on his head the famous Iron Crown of the Lombards (see CROWN, subhead *Iron Crown*), and receiving at the hands of the Pope the imperial title of Holy Roman Emperor. So came into existence that curious anomaly, the Holy Roman Empire, which endured until 1806. Many of the kings who followed Otto, possessing his ambition without his ability,



BEGINNINGS OF GERMANY

At left: Germany at the beginning of the Christian Era, showing the provinces of Raetia and Noricum added to the Roman Empire during the reign of Augustus, and the frontiers along the Rhine and Danube, by which the empire was bounded after A. D. 9.

At right: Empire of Charlemagne, as divided in 843. The Holy Roman Empire under Charlemagne was apportioned after his son's death among his three grandsons, Louis the German, Lothair and Charles the Bald, by the Treaty of Verdun.

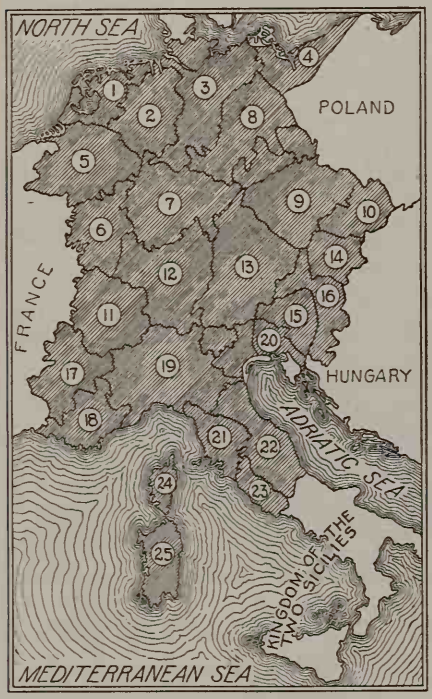
invited to aid him in his struggle with the Moravians, only to find in them a far more dangerous enemy. The reigns of Louis the Child (899-911) and of Conrad were largely taken up with vain attempts to stay the pillaging, slaughtering Magyar hordes.

King and Nobles. Though it had one king, Germany was not at that time a single state, but a number of duchies, whose rulers possessed great privileges. They elected the king, and his power depended very largely upon whether or not he retained their good will. When Conrad died in 918, the strongest of these nobles, Henry the Fowler of Saxony was chosen king, and under him much was accomplished. He defeated the Magyars and the Slavs, reduced the power of the great nobles—indeed, did a work which entitles him to rank as the real creator of the German Empire. Every lover of music is familiar with

strained all their powers to make conquests in Italy, and for the sake of this foreign field neglected Germany itself. The nobles were prompt to take advantage of this state of affairs, drawing more and more power into their hands. However, in 1024 a strong king, Conrad II, came to the throne, and for a time asserted the royal rights. He also conquered Burgundy for Germany and reduced the Polish kingdom, which had grown to a dangerous strength on the eastern frontier, to the rank of a vassal dukedom.

Conflict with the Papacy. Henry III, Conrad's son, who came to the throne in 1039, was a worthy successor of his father, and the great nobles ceased their aggressions for the time. But another conflict was beginning—a conflict which colors much of the history of medieval Germany; for the Pope, whose privilege it was to crown the Holy Roman emperors, felt

that thereby he gained the right to interfere in imperial affairs, while the emperors, as they became stronger, resented such interference. It so happened that a strong Pope, Gregory VII, and a weak emperor, Henry IV (1056-1106), were ruling at the same time, and Greg-



UNDER FREDERICK I, BARBAROSSA

1—Holland
2—Westphalia
3—Saxony
4—Pomerania
5—Brabant
6—Lorraine
7—Franconia
8—Brandenburg
9—Bohemia
10—Moravia
11—Burgundy
12—Wabia
13—Bavaria
14—Austria
15—Carinthia
16—Styria
17—Arles
18—Provence
19—Lombardy
20—Aquilia
21—Tuscany
22—Ancona
23—Patrimony of Saint Peter
24—Corsica
25—Sardinia

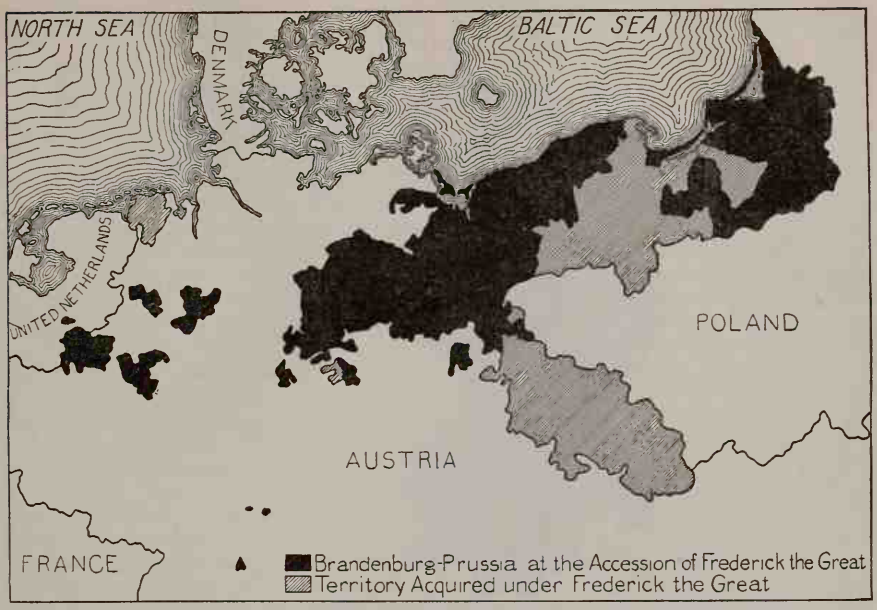
ory was able to rob Henry of some of his prerogatives and to force him to do penance in the guise of a beggar (see HENRY IV, Germany). Under Henry V (1106-1125) and Lothair (1125-1137) the imperial power diminished, so it became in reality but a shadow.

The Famous Hohenstaufens. In 1138 there came to the imperial throne a new dynasty, the Hohenstaufens, the early part of whose ruling period was the most glorious in the history of medieval Germany. These emperors had a definite purpose—they were determined to make good Germany's hold on Italy, and to wrest from the Pope his temporal powers. Religion was a dominating force through all this time, for this was the period of the Crusades (which see). Frederick I, the beloved Frederick Barbarossa (1152-1190) about whose name legends still hover, was the greatest of the Hohenstaufen emperors, and had he not met his death while on a Crusade he might have strengthened permanently the imperial power. As it was, his successors were for the most part men of little ability, and in the end their powers were so encroached upon by the Papacy and by the great nobles that when the dynasty came to an end in 1254 the titles of German king and Holy Roman emperor were but empty honors.

During this period significant changes had taken place in Germany. Manners and customs had become more refined; women had begun to be looked upon with more respect; the songs and tales of the Minnesingers (which see) had acquired wide popularity; magnificent cathedrals had risen under the influence of the religious enthusiasm generated by the Crusades, and the cities had acquired a degree of freedom and of prominence unknown before.

Another Rise and Fall. For about twenty years after the death of the last Hohenstaufen, anarchy prevailed in Germany. The electors offered the crown to the highest bidder, but of all the rival rulers none acquired any real power. Finally, in 1273, the electors picked out a man whom they thought weak enough not to interfere with their sovereign rights—Rudolph of Hapsburg; and thus that celebrated family came to the throne of Germany. Rudolph proved more vigorous than the electors had hoped, restoring at least a semblance of order and strengthening the royal authority. He showed that favor to his own family for which the Hapsburgs have been noted, and by granting to his son as a dukedom certain territories that he had acquired in war, of which the chief was Austria, he laid the foundation of the state of Austria with its long line of Hapsburg rulers.

For over a hundred years there followed another of those troubled periods, when the royal power was held first by one family, then by another. Significant events which stand out are the successful revolt of the Swiss against Austria; the proclamation by Charles IV (1348-1378) of the Golden Bull (which see), which defined the powers of the electors:

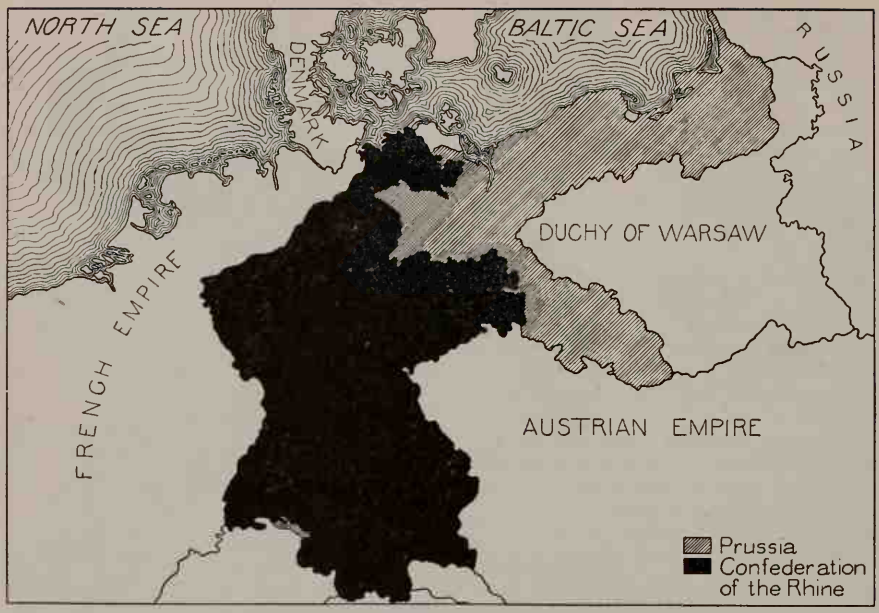


GROWTH OF PRUSSIA UNDER FREDERICK THE GREAT

and the war with the Hussites brought on by the failure of Sigismund (1410-1437) to protect John Huss as he had promised. In 1438 Albert II of Austria, the descendant of that early Albert to whom was granted the domain of Austria, was made emperor, and for almost four centuries the Hapsburgs bore the imperial title, though each time the electors went through the form of choosing. A strong man came to the throne late in the fifteenth century—Maximilian I (1493-1519); and under him the Empire became again in a sense an entity.

Even more powerful was his grandson, Charles V (1519-1556), who during much of his long reign was the dominant prince of Europe, for not only Germany, but Spain, Naples and the Netherlands were under his sway. But even during his reign, when the imperial power was at its very height, the breaking up of the empire was beginning. Luther had nailed to the church door his ninety-five theses, and therewith the Reformation had begun. (For the history of this period see LUTHER, MARTIN; REFORMATION; CHARLES V.) The conflict between Catholics and Protestants was brought to an end temporarily in 1555 by the Peace of Augsburg, which allowed to the Lutherans a certain measure of religious freedom; but this very agreement opened up new questions which were the cause of later dissension.

The Thirty Years' War. The reigns of Charles's successors, Ferdinand (1556-1564), Maximilian II (1564-1576) and Rudolph II (1576-1612), saw the growth of that important movement known as the Counter-Reformation (which see), and an ever-widening gulf between the Catholics and Protestants. In 1617, during the reign of Emperor Matthias (1612-1619), the ardent Catholic Ferdinand was crowned king of Protestant Bohemia, and the result was that gigantic struggle known as the Thirty Years' War. Conditions in Germany during the war were almost indescribable, and at its close in 1648 the country was completely exhausted. Most of the population of the country districts had been killed, enormous debts had been incurred, and many of the industries had been ruined. Moreover, most of the princes had gained, as the price of their aid in the war, practical independence, and instead of one Germany there were about two hundred small states, each of which was only nominally subject to the emperor. The imperial authority was completely wrecked, and national feeling was dead, except in so far as most of the states had come to look upon themselves as in some way opposed to Austria.



GERMANY AT THE HEIGHT OF NAPOLEON'S POWER

The French extended their empire eastward to the Baltic Sea, and included Magdeburg. At this time Westphalia was a kingdom ruled by Napoleon's brother, Jerome.

Germany to the Time of Napoleon. Meanwhile one of the states of Germany was gradually acquiring an increased power. This was Prussia, and it is in the rise of this power that the interest in German history centers for a century and a half after the close of the Thirty Years' War (see PRUSSIA, subhead *History*). In theory the ruler of Prussia, who in 1701 took the title of king, still owed allegiance to the emperor, but in reality there was growing up a determined antagonism between them. A crisis occurred in imperial affairs in 1740, when with the death of Emperor Charles VI (1711-1740) the male Hapsburg line died out, and in accordance with the Pragmatic Sanction (which see) his daughter Maria Theresa attempted to assume the imperial title (see AUSTRIA-HUNGARY, subhead *History*; MARIA THERESA; SUCCESSION WARS, subtitle *War of the Austrian Succession*). Soon after the close of the War of the Austrian Succession another war broke out, between Maria Theresa and the ambitious king of Prussia, Frederick the Great (which see). By his conduct of the Seven Years' War (which see), Frederick brought Prussia still farther to the fore as the natural enemy of Austria and as the one possible center for a future united Germany.

The great European upheaval which followed upon the French Revolution affected Germany profoundly (see NAPOLEON I), ending even the nominal existence of the empire, for in 1806 Francis II formally resigned the title of Holy Roman emperor and took that of Emperor of Austria. It was Napoleon's idea to isolate Austria and Prussia and to form of the west German states a Confederation of the Rhine, but after his fall the Congress of Vienna formed all the German states into a confederacy, with Austria at its head.

Rivalry of Austria and Prussia. The plans for the confederation included the promise of constitutions for the different states, but this provision was in the main ignored, and there were constant disturbances, owing to the demands of the people for constitutional government. It was in 1830 and 1848, those years when the revolutionary spirit was felt throughout all Europe, that these disturbances culminated, many of them successfully. In 1830 was formed the customs union or Zollverein (which see) among the states, and this fostered the growing feeling of nationality which in 1848 resulted in the assembling of a national parliament at Frankfort. But Austria and Prussia, by their rivalry, brought to naught the

federation plans, and the Prussian king, Frederick William IV, refused to accept the title of emperor of the Germans.

In the year 1861 a new king, William I, came to the throne of Prussia, and he was a man of bolder spirit. He called to his aid Bismarck, chief among the nation-builders of modern Europe, and under the direction of that determined minister the unification of Germany proceeded apace. Bismarck's deliberate plans for breaking with Austria are described in the article under his name and in that on the Seven Weeks' War. Emerging from this struggle with new prestige, Prussia gathered about her the neighboring states in a North German Confederation, of which the king of Prussia was president; but even then the ambition of Bismarck was not satisfied.

The Birth of a Nation. He saw ahead a war with France, and prepared for it carefully, so when the latter nation, jealous of the growing power of the Hohenzollerns, forced the issue, the victory of Germany was sure (see FRANCO-GERMAN WAR). France paid a large indemnity and gave back to Germany Alsace and Lorraine, those much prized territories which had belonged to Germany through a thousand years but which Louis XIV had conquered for France. More important to Germany than any territorial gain was the awakening of an intense national feeling among the states, which made it possible to change the confederation into an empire and to proclaim William I as German emperor. This was done on January 18, 1871, and the state was launched on its new career. Bismarck kept the helm during the lifetime of William I and during the short reign of his son, Frederick III, who succeeded in 1888 and died in the same year; and the colonial power of Germany, the formation in 1883 of the Triple Alliance, including Germany, Austria and Italy, and the anti-Socialist agitation were all his work.

The Reign of William II. But the Iron Chancellor, as Bismarck was called, did not find favor with the aggressive William II, who came to the throne in 1888 and showed at once his determination to be the real ruler of Germany, so far as the constitution would permit. Bismarck therefore resigned in 1890, and the list of his successors includes Caprivi, Hohenlohe, Von Bülow and Von Bethmann-Hollweg, who became chancellor in 1909. Germany took an active part in Eastern affairs in 1898 when, after the murder of two German missionaries in China, the port of Kiao-chau in Shantung was seized and made the center of a German protectorate in that region (see KIAO-CHAU). Two years later German troops were prominent in the suppression of the Boxer Rebellion (which see).

Germany and the War of the Nations. In the summer of 1914 there began in Europe that greatest struggle of all times, known as the War of the Nations. The causes, both ulterior and immediate, and the events of the war are treated in the article under that head.

Germany claimed itself not the primary aggressor in the war. From the first, public interest centered chiefly in Germany and England, between which powers the struggle was most intense. Germany constantly asserted that Great Britain was its most malignant enemy, due largely to the fact that the latter's navy was effecting a close blockade of the German Empire. So serious did the blockade become that Germany, through a submarine campaign against friend and foe alike, sought to stop all commerce to its enemies and reduce them, also, to the starvation point. Vessels of all nations were torpedoed on sight and without warning, and this direct violation of international law so alarmed the great neutral nations that on April 6, 1917, the United States declared that through Germany's acts a state of war existed between those two countries. Latin-American countries lined up in sympathy with the American republic, and before May 1 it appeared that the Teutonic empires would have to contend against the greater part of the world. A leading German official voiced the growing conviction that if victory were not achieved by German arms the Hohenzollern dynasty was doomed. See WAR OF THE NATIONS.

Consult Dawson's *German Life in Town and Country;* Wade's *Our Little German Cousin;* Henderson's *Short History of Germany;* Yonge's *Young Folks History of Germany.*

Related Subjects. The articles in these volumes referring to Germany are numerous, but the following classified index will make reference to them easy.

CITIES AND TOWNS

Aix-la-Chapelle	Breslau
Altona	Brunswick
Augsburg	Cassel
Baden	Charlottenburg
Barmen	Chemnitz
Bayreuth	Cologne
Berlin	Danzig
Bingen	Darmstadt
Blenheim	Dortmund
Bonn	Dresden
Bremen	Duisburg
Bremerhaven	Düsseldorf

OUTLINE AND QUESTIONS ON GERMANY

Outline

I. Location and Size

(1) Centrally located in Europe
(2) Latitude, 47° 16′ to 55° 53′ north
(3) Longitude, 5° 52′ to 22° 52′ east
(4) Geographic relation to other countries
(5) Effects of location
(6) Size

II. What Constitutes Germany

(1) Kingdoms
(2) Grand duchies
(3) Duchies
(4) Principalities
(5) Free cities

III. Physical Features

(1) Sea coast
  (a) About one-third of total boundary
(2) Highland and lowland
  (a) Northern lowland
    1. Part of great plain
    2. Fairly monotonous surface
  (b) Southern highland region
    1. Alpine country
    2. The highland proper
(3) Effect of surface features on history
(4) Rivers
  (a) 6,000 miles of navigable waterways
  (b) Chief rivers
(5) Lake regions

IV. Climate

(1) Comparatively even climate
  (a) Effect of mountains and sea
(2) Greater variation east and west than north and south
(3) Rainfall

V. The People

(1) National characteristics
(2) Diversified character of people
(3) Languages
(4) Population
(5) Density compared with that of other countries
(6) Cities

VI. Industries

(1) Mining
  (a) Great mineral wealth
  (b) Chief products
    1. Coal
    2. Iron
(2) Manufacturing
  (a) Marvelous recent development
  (b) Surpassed only by Great Britain and United States
  (c) Chief products
    1. Textiles
    2. Metal goods
    3. Beet sugar
    4. Beer
  (d) Industrial insurance
(3) Agriculture
  (a) Necessity for importation of foodstuffs
  (b) Methods employed
  (c) Chief crops
    1. Cereals
    2. Potatoes
    3. Hay
  (d) Stock raising

VII. Transportation and Commerce

(1) Railroads
(2) Rivers
(3) Canals
(4) Large foreign commerce

VIII. Education and Religion

(1) High rank educationally
  (a) Practically no illiterates
  (b) The school system
(2) No state church
  (a) Distribution of Protestants and Catholics

IX. Government

(1) Relation of Kaiser to states
(2) Powers of emperor
(3) The Chancellor
(4) Legislature
(5) Judicial department
(6) Colonial holdings

X. History

(1) In earliest times
(2) The era of Charlemagne
(3) The feudal period
(4) The Holy Roman Empire
(5) Struggle between Emperor and Pope
(6) The Hohenstaufen Dynasty
(7) The Reformation
(8) The Thirty Years' War
(9) The rise of Prussia
(10) The Napoleonic Era
(11) Rivalry of Austria and Prussia
(12) Franco-German War and establishment of the empire
(13) Recent development
(14) The War of the Nations

Questions

Why are not all the inhabitants of Germany Germans in the same sense in which the people of the United States are Americans?

In what way do the "folk schools" differ from primary schools in the United States?

What great emperor had to humble himself and don the guise of a beggar, and why?

In what sense was Frederick the Great the forerunner of Bismarck?

What characteristic have the Germans which takes the place of English determination and French quickness?

What typically German river has neither its source nor its mouth within Germany?

At the outbreak of the War of the Nations, how many countries surpassed Germany in value of manufactures?

How does Germany rank as regards percentage of illiteracy?

Why does not the Chancellor resign if an important policy which he has brought forward is defeated?

What was the Iron Crown of the Lombards, and when did it play a part in the history of Germany?

What were the chief effects of the Thirty Years' War?

What does the expression "a place in the sun" signify, and how has it been used in connection with Germany?

How might the history of this country have been different if there had been no mountain systems?

What product still obtained along the Baltic coast was famous in the days of the Roman Empire?

What medieval king of Germany was made famous by one of the greatest music dramas of modern times?

When did the nailing of certain "theses" on a door change the history of a continent?

How far can you travel in a straight line in Germany?

How does the highest point in Germany compare in altitude with the highest in France? In England? In Alberta?

How does Germany rank as a coal producer? As an iron producer?

How many countries have a greater railroad mileage? How many have a greater mileage in proportion to population?

How did the Franco-German War help in the founding of the empire?

What part of North America is approximately in the same latitude as Germany?

Why are the transient birds of the country very numerous?

Who deliberately plunged the nation into war in order to humble a rival?

What mountains in Germany are not called mountains?

What early battle on German soil ranks among the world's decisive conflicts?

How many countries of Europe have a greater average density of population?

What is the difference in the ordinary meaning of the word *gymnasium* in Germany and in America?

What is the first known fact in the history of Germany?

How many countries of Europe are larger than Germany? How many states of the United States? How many provinces of Canada?

What is there of peculiar interest about the distribution of Catholics and Protestants in the Empire?

Elberfeld
Ems
Erfurt
Essen
Frankfort-on-the-Main
Frankfort-on-the-Oder
Halle
Hamburg
Heidelberg
Jena
Karlsruhe
Kiel
Königsberg
Krefeld
Leipzig
Lübeck
Ludwigshafen
Magdeburg
Mainz
Mannheim
Metz
Munich
Münster
Nuremberg
Oberammergau
Osnabrück
Posen
Potsdam
Ratisbon
Rostock
Stettin
Strassburg
Stuttgart
Ulm
Wiesbaden
Wittenberg
Worms
Würzburg

COLONIES

See list in article above.

HISTORY

Augsburg Confession
Balance of Power
Berlin, Congress of
Counter-Reformation
Elector, German Imperial
Franco-German War
Free Cities
Golden Bull
Hanseatic League
Hessians
Hohenstaufen
Hohenzollern
Holy Alliance
Holy Roman Empire
Lützen, Battles of
Peasants' War
Reformation
Sadowa, Battle of
Schmalkaldic League
Seven Weeks' War
Seven Years' War
Succession Wars
Thirty Years' War
Trent, Council of
Triple Alliance
Vienna, Congress of
War of the Nations
Zollverein

Much of the history of the country is contained in the articles on the rulers or other distinguished men:

Bethmann-Hollweg
Bismarck-Schönhausen, Prince
Blücher, Gebhard von
Bülow, Prince von
Charlemagne
Charles
Ferdinand I and II
Frederick I, Barbarossa
Frederick I, II and III
Frederick William I, III and IV
Henry III, IV and VI
Hindenburg, Marshal von
Louis, the German
Luther, Martin
Maximilian I
Moltke, Count von
Stein, Baron von
Tilly, Count of
Wallenstein, Duke of
William I and II

ISLANDS

Admiralty
Bismarck Archipelago
Helgoland
Ladrone
New Guinea
Samoa

MOUNTAINS

Alps
Black Forest
Harz
Jura
Riesen-Gebirge
Vosges

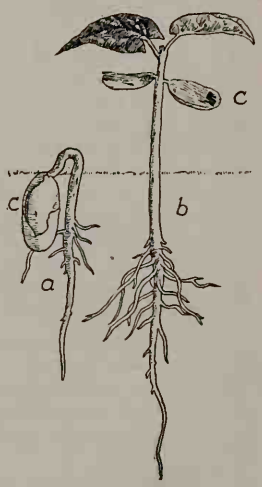
RIVERS

Danube
Elbe
Main
Moselle
Oder
Rhine
Spree
Vistula
Weser

STATES

Alsace-Lorraine
Baden
Bavaria
Brandenburg
Brunswick
Hanover
Hesse
Mecklenburg-Schwerin
Oldenburg
Palatinate
Pomerania
Posen
Prussia
Saxony
Schleswig-Holstein
Silesia
Württemberg

GERMINATION, *jer mi na' shun,* the process by which the germ of a plant organism begins to develop into a perfect plant. The term is derived from the Latin *germen,* meaning *bud,* and is often used interchangeably with *sprouting.* The miracle of growth — the emergence of a tender green shoot from the moist, warm earth in the spring time, after the planting of the ripened seed — is one of the most familiar and yet one of the most wonderful facts in nature. What has taken place is the awakening to activity of the germ of life—the *embryo,* or inner kernel, of the seed. The embryo is itself a miniature plant, and in many cases it has a fairly definite set of organs—a little point at one end called the *hypocotyl,* which is a rudimentary stem; one or two seed leaves, called *cotyledons;* and a *plumule,* or seed bud. See SEEDS.



GERMINATION

Two stages in the growth of the bean. (*a*) Taproot; (*b*) hypocotyl (the portion of the stem below the cotyledon); (*c c*) the cotyledon.

There are three conditions which are necessary for the sprouting of a seed. These are warmth, moisture and a supply of oxygen. Different plants vary in their temperature requirements, and the farmer must learn by experience when to sow the various grains and vegetables. Corn planted too soon will decay in the ground, but peas can safely be sown not long after the soil is free from frost. The following table shows the temperatures required by a few well-known plants; the degrees are on the Fahrenheit scale:

	LOWEST	HIGHEST	MOST FAVORABLE
Barley	32°-41°	100.4°	84°
Wheat	32°-41°	107.6°	84°
Indian Corn	49°	115°	91.4°
Squash	57°	115°	91.4°
Muskmelon and Cucumber	60°	117°	93°

Moisture softens the outer coat of the seed, relaxes the tissues of the embryo and also dissolves certain food materials present in the seeds so they may be assimilated. Too little moisture and too much are equally injurious to growth, for the first condition retards germination, and the second causes many species to decay because of lack of air. A supply of oxygen is necessary, because without this substance certain chemical changes which accompany growth cannot take place. The time required for germination varies greatly with different plants. Seeds of trees and shrubs usually take more time to sprout than do those of grains, grasses and vegetables; the ash and hornbeam, for instance, do not grow until the second spring after the sowing. Parsley seeds sprout in about two weeks, and those of grains, grasses and many herbs of the pea family in from two to eight days.

Examples of Germination. The bean is a good example of those plants which have two seed leaves (cotyledons), both of which rise above the ground during the growing process (see COTYLEDON). First, the outer coat of the seed (the *testa*) splits open, and a conelike outgrowth pushes its way downward into the soil, soon developing a covering of fine hairs on its sides. This is the beginning of the root system of the plant. Then the cotyledons burst open, and as they rise from the ground a green stem develops between them and the roots in the soil. Under the action of the sunlight the cotyledons turn green, but as the nourishment stored in them is absorbed by the plant they wither and fall. Their place, however, is taken by a pair of true leaves, which, with the developing root system, supply the young plant with food.

The pea, another plant with two seed leaves, germinates differently, for its cotyledons remain in the ground while their nourishment is being absorbed, and the first leaf that appears above ground is a true leaf. The germination of seeds having but one cotyledon is illustrated by that of the Indian corn. Here the nourishment is stored at the large end of the kernel. As in case of the pea, the nourishment is absorbed while the seed leaf remains underground, and the first leaf above ground is a true leaf. W.F.R.

GERM THEORY OF DISEASE. See DISEASE, subtitle *Disease in the Human Body.*

GEROME, *zha rom',* JEAN LEON (1824-1904), a French painter and sculptor, considered one of the most eminent artists of the later nineteenth century. He received practically all of his early training from Paul Delaroche; this was supplemented by extensive travel. His work is remarkable for perfect drawing and grouping, although critics consider his color often lacking in warmth. Most of his pictures are in French museums, but he is also well represented in American collections, particularly the Metropolitan Museum, New York City. Some of his famous paintings are *Gladiators from Caesar, The Age of Augustus, Slave Market in Rome, Death of Caesar* and *Duel After a Masked Ball.* With the article CAESAR is a faithful reproduction, in halftone, of the *Death of Caesar.*

GERONIMO, *je ron' i mo* (?1834-1909), an Apache chief of the Chiricahua band, who during the years 1884 and 1886, as the leader of a band of savages, made hostile raids into New Mexico and Arizona. General Crook forced him to surrender in 1886, but on the march to Fort Bowie, where imprisonment awaited them, the Indians escaped and renewed their depredations. The vigorous measures of General Miles, who replaced General Crook, resulted in the second surrender of Geronimo, who was sent to Fort Pickens, Fla., and later to Fort Sill, Okla., where he was held as a military prisoner until his death.

GERONIMO

GERRYMANDER, *ger i man' der,* a word coined in the United States in 1812, defining an unsatisfactory division of a state into political districts. When Elbridge Gerry was governor of Massachusetts the legislature made a new division of the districts for the election of state senators, grouping the counties together that returned large Federalist majorities. By this means the representation of the Federalist party in the legislature was reduced. One district, under the new law, was so unusual in

outline that in form it was not unlike some horrible animal. Nathan Hale, named for the Revolutionary hero, one of the editors of the *Weekly Messenger*, drew the geographical figure and exhibited it at a dinner party. Some said it looked like a salamander. "No," said another, "it is a *Gerrymander*." For years the word was used by the Federalists as a term of contempt for the governor and the Demo-

THE FIRST GERRYMANDER

The misshapen district suggested to opponents of the responsible political party the addition of forked tongue, wings and claws.

cratic legislature which had established the artificial redistricting of the state. The word has been fully incorporated into the language, and is used very generally in its verb form.

Many states are *gerrymandered* by nature. The most famous gerrymander in the United States since the original one of 1812 was the "shoestring district" (Sixth Congressional) in Mississippi. It was formed to minimize the negro vote, and consisted of all the counties in the state along the Mississippi River; it was about 300 miles long and only about twenty miles broad.

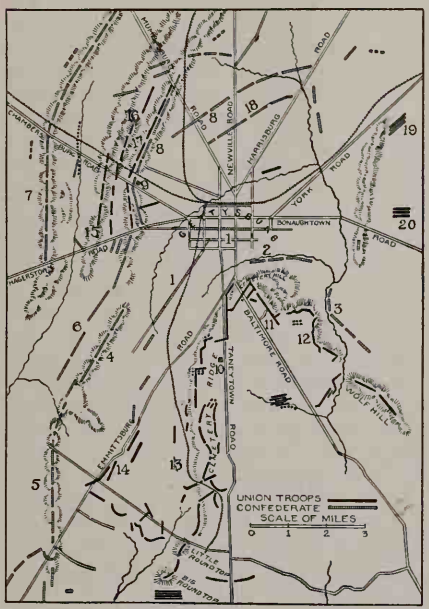
Elbridge Gerry (1744-1814) was the governor of Massachusetts whose name is perpetuated in the word *gerrymander*. He was born in Marblehead, Mass., was graduated at Harvard College in 1762, and died at Washington, D. C., November 23, 1814. At the time of his death he was Vice-President of the United States. He was a signer of the Declaration of Independence; a member of the United States Constitutional Convention, a member of Congress for several years, and in 1797 was sent to France to establish diplomatic relations with that country. His term as governor of Massachusetts was from 1810 to 1812.

GETHSEMANE, *geth sem' a ne*, a beautiful garden filled with olive trees located about a mile east of Jerusalem, between the River Kedron and the Mount of Olives. During His mission on earth Jesus often retired to this spot for meditation and prayer. It is now forever sacred, because it was the scene of His agony, His betrayal by Judas and His arrest. Although the exact location is not known, the Latins have built a wall around a plot of ground 140 by 150 feet just across the river from Jerusalem, and have arranged it as a European garden and have preserved it as the sacred spot. The Greeks, envious of the Latins, have inclosed a place a little north beside the Virgin's tomb, and contend that this is the true Garden.

GETTYSBURG, *get' iz burg*, BATTLE OF, a decisive engagement of the War of Secession, generally regarded as the turning point of the struggle between the North and South. Thereafter the fortunes of the Confederacy gradually waned. In this hotly-contested battle, which was fought July 1, 2 and 3, 1863, at Gettysburg, Pa., Lee's magnificent army of Northern Virginia, numbering about 70,000, was defeated by the Federal army of the Potomac, commanded by General George G. Meade. About 93,500 of the Union force of over 100,000 took part in the field operations. After the Confederate victory of Chancellorsville (May 2-4), the two armies lay encamped for some time on opposite sides of the Rappahannock, at Fredericksburg, Va. In the meantime Lee reorganized his forces, which he divided into three sections, placing over them Longstreet, Ewell and A. P. Hill. He then laid his plans for a second invasion of the North, hoping thereby to defeat the Federal army, capture Washington, and bring the war to a close favorable to the Confederacy.

On June 3 the main body of the Confederate forces began their northward movement. The Federals followed, and on July 1 the advance forces of the two armies faced each other at Gettysburg, which lies at the foot of two ridges. Directly to the south is the one known as Cemetery Ridge, which is shaped like a fishhook. Three elevations crown its summit, Culp's Hill, at the barb of the hook, and Little Round Top and Round Top, at the other extremity. A mile to the west rises Seminary Ridge, which was occupied by Lee's army as its various divisions arrived.

On the morning of July 1 the Federal advance was forced through the town to Cemetery Ridge, where a strong defensive position was taken. Both sides lost heavily during the day. That night and the following day nearly the whole of each army was brought on the field, and the battle was resumed in earnest



THE FIELD OF GETTYSBURG

1—Rode's division	11—Howard's corps
2—Ewell's division	12—Slocum's corps
3—Johnson's division	13—Sickles' corps
4—Pickett's division, July 3.	14—Sickles' advance, July 2.
5—Longstreet's corps	15—Meredith's corps
6—A. P. Hill's corps	16—Cutler
7—Hith's division	17—Reynolds
8—Ewell's corps	18—Schurz
9—Lee's headquarters	19—Stuart's cavalry
10—Meade's headquarters	20—Gregg's cavalry

during the afternoon of July 2. The Federals formed their line along Cemetery Ridge, from Culp's Hill to Round Top. The Confederates opened the attack, driving back the Union left under General Sickles, with terrible loss on both sides, and securing a temporary foothold on a section of Culp's Hill. From this position, however, they were driven out early on the morning of July 3.

The crucial attack of the battle began at one o'clock, on the third day. Lee, against the advice of Longstreet, decided to make a general assault on the Union center, under the command of General Hancock. For nearly two hours the valley between Cemetery and Seminary ridges reëchoed to the sounds of a furious cannonade. Finally the Union commander gave the order to cease firing, so that the guns might cool. At three o'clock, Lee, thinking that he had silenced the batteries of the enemy, ordered General Pickett to charge the Federal line.

Then occurred one of the most magnificent and daring attacks in history, almost worthy to be compared to the famous charge of the Light Brigade at the Battle of Balaklava (see CHARGE OF THE LIGHT BRIGADE). Fifteen thousand of the flower of the Confederate army swept across the valley and up the slopes of Cemetery Ridge, facing a murderous fire that sent great numbers to their death. They carried the first line of the Federal center in a desperate hand-to-hand fight, but no human force could withstand the storm of shot and shell that met them. "Here the great wave of attack reached its high-water mark; here its terrible force was spent and the tide turned, never to rise again" (Montgomery).

This was practically the end of the Battle of Gettysburg, and by the morning of July 5, the Confederates were in full retreat towards Virginia. Meade's losses were so serious that he made no attempt to pursue the retreating army. The official estimate of the Union loss is 23,003; of the Confederate, 20,451. On November 19 of the same year, President Lincoln delivered his immortal *Gettysburg Address* at the dedication of the National Cemetery on Cemetery Ridge.

The Gettysburg Address. In ten sentences, containing only 267 words, spoken under the inspiration of a great and solemn assemblage, Abraham Lincoln gave to the ages America's noblest example of oratory. It was a masterpiece of logic, faultless in sentence structure, forceful in its choice of words, and above all, breathed the purest patriotism—the kind which grips men's hearts and stamps immortal truths upon their minds. In the simple manner characteristic of the man, he said:

> Fourscore and seven years ago, our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated in the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this. But in a larger

sense we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here, have consecrated it far above our poor power to add or detract. The world will little note, nor long remember, what we say here, but it can never forget what they did here. It is for us, the living, rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us, —that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion,—that we here highly resolve that these dead shall not have died in vain,—that this nation, under God, shall have a new birth of freedom,—and that government of the people, by the people, for the people, shall not perish from the earth.

GEYSER, *gi'ser,* or *gi'zer.* In the volcanic regions of Iceland, New Zealand and Yellowstone National Park there are very striking exhibitions of the earth's internal heat in the wonderful natural fountains, called *geysers,*

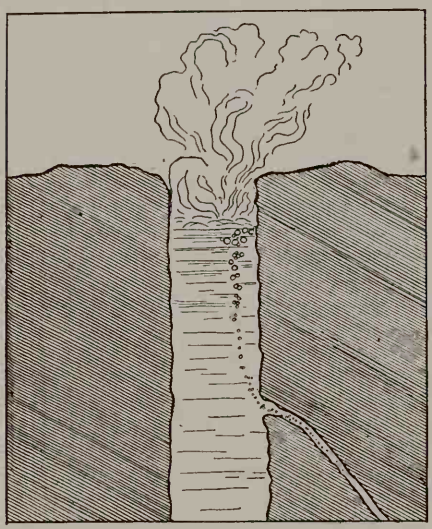


DIAGRAM OF GEYSER

Showing the tube and one of the fissures for supplying the tube.

from which streams of boiling water and steam shoot high into the air at varying intervals. Geysers have often been compared to volcanoes, for they act much the same, but instead of molten rock, they shoot forth water containing silica in solution.

Origin and Action. Geysers form along the lines of drainage, that is, near rivers and lakes, from the surface water which works down through cracks in the rocks and lava, until, at some unknown depth, it comes in contact with rocks sufficiently hot to boil it. The rocks are much hotter than is necessary to heat the water to the boiling point, and as more water trickles down, the pressure of the cooler water near the surface becomes very great on the boiling water beneath.

When the pressure of the steam formed at the bottom becomes stronger than that from above, the steam must escape, so it forces the water above it up through an opening in the rocks, called a *tube.* As soon as a little of the water overflows upon the surface of the earth the pressure below is relieved, and the steam shoots out, taking a great amount of water with it. The eruption occurs very suddenly, and after it ceases much of the water which falls around the geyser evaporates, leaving deposits of silica or lime carbonate that often take on beautiful and fascinating forms.

Some geysers, such as the Giantess in Yellowstone National Park, never form cones, but appear as pools of wonderfully clear water, except when in action. Very little water is left after an eruption in those which have cones, except in such cases as that of the tiny Model, also in Yellowstone National Park, where all the water ejected falls back into the cuplike cone and returns to the depths of the earth to be reheated. The eruption of geysers is caused by the gradual filling of the crater with water, which is forced up by the steam generated in the cavity below. The water prevents the escape of the steam, and as it rises in the crater, the pressure of steam below increases. Finally, the water reaches the top of the crater, and begins to overflow. With the overflow the pressure in the crater lessens and the steam under high pressure expands with such force as to drive all the water out of the crater, often throwing it over a hundred feet into the air. After the water has been expelled a flow of steam follows for several minutes. The geyser then becomes quiet and remains in this state until the crater is again filled, when another eruption occurs.

In course of time geysers cease to act and become hot springs. However, this process is very slow and the formation of new geysers offsets the decay or drying up of old ones, so that it will be thousands of years before they cease to exist. The prevalent idea that geysers erupt at regular intervals is false, although a few geysers, such as Old Faithful in Yellowstone Park, send forth their shower at somewhat definite periods.

Their Distribution. In Iceland the volcanic forces are still active, and in New Zealand the recent eruption of Tarawera showed that molten rock still exists; but in Yellowstone National Park, where there are sixty active geysers located on an elevated volcanic plateau, there are no evidences of fresh lava flow. In the barren lava fields of Iceland, which is well named the land of frost and fire, are located the Geyser and the Strokhr, the two famous geysers of that region, seventy miles from Reykjavik, Iceland's capital. In strong contrast is the location of the New Zealand geysers, which are situated in a country clothed in luxuriant vegetation. The delicate "pink and white terraces," which rise like stairways of beautifully sculptured marble above the dull green waters of Lake Rotomahana, in that country, were formed from the Terata geyser, standing like a fountain at the head of the stairway.

Yellowstone National Park contains the largest and most active geyser region in the world. See YELLOWSTONE NATIONAL PARK; ICELAND; NEW ZEALAND. E.S.

Consult Dana's *Geology;* Hague's *Geology of the Yellowstone National Park.*

GHATS, or **GHAUTS,** *gawtz,* two ranges of mountains running parallel with the east and west coast of India, generally known as the Eastern and Western Ghats. The Western Ghats are more continuous than the Eastern range, and extend from the River Tapti to Cape Comorin, the most southerly point of the peninsula, with peaks varying from 4,000 to 8,700 feet in height. The Eastern Ghats have an average height of 1,500 feet.

The term *ghats* is also applied to landing places by the side of Indian rivers, with broad flights of stairs leading to long, high buildings or temples. Up and down these ghats, especially those on the banks of the sacred River Ganges, thousands of Hindus pass daily to and from their bath in the holy waters.

GHEBERS, *ge'burz,* or **GABERS,** *ga'burz,* is a name applied to the followers of the ancient Persian religion of Zoroaster (which see). When the Mohammedans invaded Persia in the seventh century, the Ghebers were driven to the western coast of India, where they are now known as the *Parsees.* The few remaining in Persia are found chiefly in Kirman or Yezd, and have been reduced by persecution to poverty and ignorance. Those who settled in India are among the highest native classes, and are regarded with favor by reason of their honesty, morality and observance of the law. They do not bury their dead, but expose them on what they call "Towers of Silence," but this custom is dying out gradually, owing to the opposition of the British government. They worship fire as an emblem of purity and good. They have strict regulations as to diet, and do not marry outside their own people. See PARSEES.

GHENT, called *gent* in America, but *gông* in Europe, is the capital of the province of East Flanders, in Belgium. It was founded in the seventh century by Baldwin, the first Count of Flanders, and it grew in importance until in the fifteenth century it became the chief center of European textile industries. It is situated at the junction of the Scheldt and Lys rivers, thirty-one miles northwest of Brussels. Like all Belgian cities, it is intersected by a network of streams and canals, crossed by more than 200 bridges. The older portion of the town is of great interest to tourists, having a medieval aspect and possessing many buildings of historic interest. The cathedral, part of which dates from 941, has a plain exterior for which the splendidly-decorated interior amply compensates. The town hall, erected in the sixteenth century, is the finest example of Gothic architecture in Belgium.

Although Ghent has greatly declined in commercial importance its industries were still extensive at the outbreak of the War of the Nations in 1914. It has a number of linen, wool and cotton mills, lace factories, tanneries, breweries and sugar refineries. The city is also noted for its flowers, which in times of peace are exported to all parts of Europe. Since the days of its foundation, Ghent has been a center of strife and war, and its citizens have at all times shown their willingness to take up arms in defense of their privileges and property. In the fourteenth century the wealthy merchants of the city maintained an army of 20,000 men. In 1794 Ghent was annexed to France, becoming the capital of the Department of the Scheldt. It became part of the kingdom of the Netherlands in 1814, and was retained by Belgium when that country obtained its independence in 1830. The city was occupied by the Germans, without opposition, at the outbreak of the War of the Nations, and because bombardment was avoided, the historic buildings were preserved. The treaty which ended the War of 1812, between Great Britain and the United States, was signed here. Population in 1912, 167,177.

Treaty of Ghent, the treaty which ended the War of 1812 between Great Britain and the United States. It was signed December 24, 1814, and ratified February 17, 1815. The American negotiators were John Quincy Adams, James A. Bagard, Henry Clay, Jonathan Russell and Albert Gallatin. The terms of the treaty restored all territory to its ownership previous to the war, appointed a commission to settle matters relating to the international boundary and bound both America and England to use their utmost influence to stamp out slavery. Many points which afterwards caused friction were overlooked, and it was generally felt that the United States negotiators had not strongly insisted on a cessation of impressment of American seamen, one of the chief causes of the war. However, that issue never again appeared in the relations of the two countries. The rights of Americans to participate in the Newfoundland fisheries were also overlooked. These matters were settled by subsequent negotiation. F.ST.A.

GHETTO, *get'o,* the Jewish quarter of a large city. The word is probably derived from the Talmudic word *ghet,* signifying *separation.* In the Middle Ages the Jews' quarter of a large town was known as the Ghetto, outside of which they were not permitted to take up residence. The name now has no legal significance, but is popularly applied to the section of a large city occupied of their own choice by Jews of the poorer classes. The largest and most densely-populated Ghetto in the world is located on the "East Side" in New York City, where a single city block contains 3,000 to 5,000 population. Six hundred persons are often housed in one tenement building, the majority of them being employed in sweatshops (see SWEATSHOP SYSTEM). The population of the New York Ghetto is estimated at 350,000.

The Ghetto originated in Rome, instituted by Pope Paul IV. He allotted the Jews a distinct quarter, comprising a few narrow, unhealthful streets on the banks of the Tiber River, and extending from the bridge, Quattro Capi, to the present Place of Tears. Walls and gates that could be guarded enclosed the "Jews' Suburb." On the twenty-sixth of July, 1556, the Jews entered the Ghetto, weeping and wailing, like their ancestors when taken into the Captivity. In the eighteenth century Innocent XIII decreed that the Jews should have no other trade or profession than in rags, old clothes and broken iron, which was called *stracci feracci.* In 1740 Benedict XIV permitted them to add to this the trade in new cloth wares, which in Rome they carry on to the present day. Pius IX was more liberal than his predecessors, for he ordered the walls of the Ghetto pulled down, and the Jews are now at liberty to reside where they please in Rome. The Ghetto of London has been presented in fiction by Zangwill in his *Children of the Ghetto* and the New York East Side life has been depicted in the works of Henry Harland, Abraham Cahan and Hutchins Hapgood.

Consult Hapgood's *Spirit of the Ghetto;* Philipson's *Old European Jewries.*

GHIBELLINES, *gib'el linz.* See GUELPHS AND GHIBELLINES.

GHIBERTI, *ge bair'te,* LORENZO (1378-1455), ranks highest with Donatello, his friend, among the grand Italian sculptors and goldsmiths of the Renaissance. His art has been perpetuated by his bronze gates for the baptistery of Florence, which in beauty of ornamentation and perfection of form and finish in every detail have never been equaled. They are counted among the finest works of art in Italy, and far surpass anything of the kind attempted since the days of the ancient Greeks. They must still have shone with all the brightness of their original gilding, when, a century later, Michelangelo pronounced them "worthy to be the gates of Paradise." The first gate, upon which Ghiberti was engaged for twenty years, consists of twenty-eight panels, representing incidents in the lives of Christ, the fathers of the Church, and the Evangelists. So greatly was this admired that the artist received the order for a second gate, which took as much time to complete; the subjects this time were taken from the Old Testament.

Next to the gates for the baptistery, Ghiberti's chief works still in existence are his three statues of Saint John the Baptist, Saint Matthew and Saint Stephen. In the church of San Michele, at Florence, are to be found bas-reliefs, statues and some excellent painted glass windows. He also is famed as an architect, but his skill as a sculptor and goldsmith far eclipsed his other attainments. Ghiberti died at the age of seventy-seven in his native city, Florence.

GHIRLANDAJO, *geer lahn dah'yo,* DOMENICO DEL (1449-1495), occupies a prominent place among the Florentine painters of the Renaissance. Not until the age of thirty-one did he begin his life work, and in a brief period of fourteen years he became one of the most

proficient painters of his time, presenting the life of the Renaissance as he saw and knew it in the town which he knew and loved best—his native Florence.

Ghirlandajo, which means *garland-maker,* was a nickname that clung to Domenico from the employment of his father, who fashioned the metallic garlands worn by the Florentine maidens. His first work of importance, the frescoes in the Sistine Chapel, are notable for their excellence in composition and perspective. Among his best works are the frescoes in the Sassetti Chapel of the Trinity Church and in the choir of Santa Maria Novella at Florence; and his paintings, the *Last Supper, Saint Jerome, Coronation of the Virgin* and *Adoration of the Kings,* now in the Academy at Florence. Ghirlandajo had a happy faculty of bringing many notable personages of his day into his paintings, which makes his work invaluable to the student of his time.

GHOSTS, *gohsts,* shadowy figures of the dead as imagined by living persons. The belief in ghosts has furnished topics for countless gruesome stories and has led to many superstitious fears. They have been credited with remarkable powers, and in the past terror was felt for the returning spirit of anyone who died a violent death or who was concerned with a murder. Tales of haunted houses show that this feeling still exists, but in most civilized countries nowadays ghosts merely furnish a topic which permits of unlimited play of the imagination in stories told at dusk or in the dim firelight's glow.

One of the most famous ghosts in literature is that of Hamlet's father, in Shakespeare's tragedy *Hamlet.* Marley's Ghost in Dickens' *The Christmas Carol* changes a miserly, hard old man to a cheerful, helpful giver. *Ghosts,* one of Ibsen's most thrilling dramas, is a ghost story showing the results of inherited evil.

Various theories have been advanced concerning belief in ghosts. It has been suggested that it arose from dreams. A dream in which a dead person figures may have been so realistic the dreamer believed the dead had really come back in person; or the dreamer may have believed that while sleeping his own soul left his body and visited and talked with the dead. At any rate, the belief in the return of the dead in the form of ghosts has played an important part in religious beliefs, and various religious theories have developed therefrom, such as ancestor worship, belief in immortality, witchcraft, nature worship and totemism (see IMMORTALITY; WITCHCRAFT; TOTEM). North American Indians have a religious dance called the *ghost dance,* which is performed at night and for which a white cloak is worn. The superstitious fears of negroes are well known, and acting on that knowledge, the Ku-Klux Klan, with its ghostly garments, was organized in the Southern United States at the close of the War of Secession, to frighten negroes into political submission.

Consult O'Donnell's *Ghostly Phenomena;* Jastrow's *The Study of Religion.*

GIANTS, *ji'antz,* a word commonly applied to unusually tall men and women. The average height of men throughout the world is about five feet five inches; but each race has an average height of its own which changes little from generation to generation, and which often varies considerably from the general average of all men.

Machnow, a Russian, born at Charknow, was exhibited in London in his twenty-third year, in 1905; he was then nine feet three inches in height and weighed 360 pounds. From his wrist to the tip of his second finger he measured two feet. Chang-wu-gon, a Chinese giant, was seven feet nine inches high; Anna Swan, a native of Nova Scotia, and her husband, Captain Bates, a native of Kentucky, each measured over eight feet.

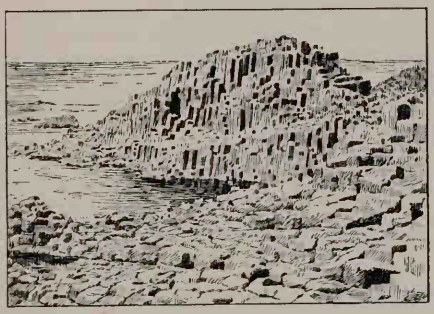
It was the general belief of the ancients that the human race in their day had degenerated, the men of primeval ages having been of so far greater stature and strength as to be gigantic. The idea conveyed by the word in classic mythology is that of beings more or less manlike, but enormous in size and strength. Giants of Greek mythology were believed to personify the elements of nature and were said to have sprung from the blood of Uranus (Heaven), which fell into the lap of Ge (the Earth).

Giants figure largely in Celtic and Scandinavian mythology and legends. The giants Fingal and his son Ossian belong to the legends of the Irish. The giants of the Welsh are familiar to everyone through the achievements of Jack the Giant Killer.

Races of giants are first mentioned in the Bible in *Genesis* VI, 4.

Og, the King of Bashan, had a bedstead nine cubits long, a cubit being 25.19 inches. Goliath, who measured six cubits and a span, and who was slain by David, is the most celebrated of the giants mentioned in the Bible.

GIANTS' CAUSE'WAY, a remarkable group of basaltic rocks on the north coast of County Antrim, Ireland. The causeway proper is a promontory formed of about 40,000 columns, fitting into each other perfectly and jointed



GIANTS' CAUSEWAY

horizontally. Some of the pillars are twenty feet in height, and vary in diameter from fifteen to twenty inches. Different groups are known as the *Wishing Chair, Lady's Fan, Giants' Loom, Giants' Organ,* etc. The peculiar pillarlike construction of the rocks is declared by geologists to result from contraction in the cooling of the lava of which they are composed. The Giants' Causeway derived its name from the legend which ascribes its construction to Finn M'Coul, or Fingal, who bridged the channel from Ireland to Scotland in order that the giants might pass from one country to the other.

In 1883 an electric railway, the first in the United Kingdom, connecting the Causeway with neighboring towns, was opened for traffic. An admission fee is charged, as in 1898 the Causeway and certain neighboring territory were declared to be private property.

GIBBON, *gib'un,* a small, tailless anthropoid, or manlike ape, belonging to the same family as the gorilla and chimpanzee. It is found in all parts of the East Indies, where it inhabits the forests, living almost entirely in the trees and traveling with great rapidity through the tangled growth. Its color is black, with a white fringe or beard surrounding the face. Gibbons are extremely awkward on the ground and move with difficulty, using their extremely long arms to balance themselves, but never creeping on all fours. At night they sleep curled up in a ball in the branches of trees or on rudely constructed platforms.

Their natural food consists of fruit and nuts, though they frequently kill and eat small birds. They are easily tamed, and when in captivity soon acquire a taste for all cooked foods. The long-armed gibbon of Sumatra is said to display wonderful agility in springing from tree to tree, clearing with ease a space of forty feet. In their native haunts gibbons are very noisy, chattering incessantly; they are particularly so in the early morning, when they greet daylight with a concert of long-drawn-out "wa-hoos." The origin of the name is unknown.

GIBBON, EDWARD (1737-1794), was an English historian whose reputation in connection with a great history of the Roman Empire makes his fame secure. He was born in Putney, Surrey. Owing to much illness in childhood his education was irregular. He entered Magdalen College, Oxford University, in 1752, and was expelled after fourteen months on account of his profession of the Roman Catholic faith. He soon renounced this creed, doubtless influenced by the arguments of the Calvinistic minister at Lausanne, under whose instruction he was placed following his expulsion from Oxford. In 1758 he returned to England, and in 1774 was elected to Parliament.

EDWARD GIBBON
"His writing was as poetical as a picture."

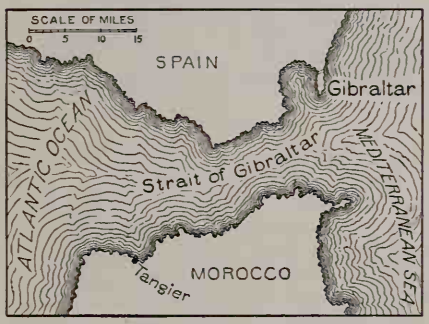
His life work was the *History of the Decline and Fall of the Roman Empire,* which is considered not only one of the greatest histories ever written, but a remarkable literary achievement. While it has been attacked in minor points, in essentials it is still the standard authority for the period it covers. It is really a history of the civilized world for the thirteen centuries during which paganism was weakening and Christianity was gaining a foothold. An important criticism is that owing to the author's lack of religious belief at the time the history was written he belittled the influence of Christianity as a civilizing factor. Byron termed Gibbon "the lord of irony," referring to his stately and measured style. Some critics consider the historian at his best in his autobiography, which was published after his death under the title of *Memories of My Life and Writings.*

GIBBONS, *gib'unz,* JAMES (1834-), a Roman Catholic churchman of wide scholarship and influence, the first American to be created a cardinal. He was born in Baltimore, but began his education in Ireland, where he remained until he was fourteen years of age. Completing his studies at Saint Charles' College, Maryland, and at Saint Mary's Seminary, Baltimore, he was ordained a priest in 1861. He began his work as assistant in the parish of Saint Patrick's, Baltimore, was transferred to Saint Bridget's, in Canton, a suburb of Baltimore, and later became secretary to Archbishop Spalding. Through the offices of bishop and vicar apostolic of North Carolina, bishop of Richmond and coadjutor archbishop of Baltimore, he rose to the rank of archbishop of Baltimore, succeeding Archbishop Bailey in that dignity in 1877. Nine years later he attained the highest honor of his career—his appointment as cardinal by Pope Leo XIII. In 1887, the year following, he visited Rome and was formally inducted into membership in the College of Cardinals (see CARDINAL).

Cardinal Gibbons is known throughout America as a man of broad enlightenment and progressive ideals. He is the author of *The Faith of Our Fathers, Our Christian Heritage* and *The Ambassador of Christ.* He was active in the movement looking toward the establishment of peace between the warring nations of Europe in 1915. G.W.M.

GIBRALTAR, *jib ral' tar,* the strongest fortress in the world, situated on a rocky peninsula near the southernmost point of Spain. It is called the "Key to the Mediterranean." With a small town at the base of the rock it forms a British colony, having been captured by English and Dutch forces in 1704, and assigned to Britain by the Treaty of Utrecht in 1713, at the close of the War of the Spanish Succession (see SUCCESSION WARS). The Rock of Gibraltar rises abruptly from the water and overlooks the narrow strait connecting the Mediterranean Sea with the Atlantic Ocean. The strait is from nine to thirteen miles wide; all vessels passing through it come under the muzzles of the huge guns of the fortress. The rocky promontory on which the fortress stands is connected with the mainland by a low sandy isthmus one and a half miles long and three-fourths of a mile wide. This strip forms a "neutral zone" between Spain and Britain's rock, and the approach is guarded by guns and mines. Guns of the largest caliber and newest design also protect the sea front, the rock being inaccessible.

Gibraltar seen from the sea appears to be a dark, somber and forbidding mass of marble, but hidden from sight from the strait are beautiful, grassy, wooded glens where flowers grow, and where partridges, woodcocks and other game birds are found in large numbers. Small Barbary apes inhabit the rocks and many are captured and kept by the soldiers of the garrison. The approaches to the fortress are strictly guarded, and there are many secret passages and storehouses cut in the rock, their positions being jealously guarded by officials. The garrison usually numbers about 5,000 men.



GIBRALTAR, A STRONGHOLD OF GREAT BRITAIN

Strait of Gibraltar, the narrow channel between the "Pillars of Hercules," connecting the Mediterranean Sea and the Atlantic Ocean, and separating Spain from the northern coast of Africa. It is forty miles long and varies in width from nine to thirteen miles. There is practically no tide in the Mediterranean, and it has been found that there is a continuous under-current flowing westward through the strait, carrying the surplus waters of the landlocked sea into the ocean. See HERCULES, PILLARS OF.

Consult Field's *Gibraltar;* Lang's *Gibraltar and the West Indies.*

GIBSON, CHARLES DANA (1867-), an American illustrator and artist, famous for his

drawing of a characteristic society woman which has become known as the "Gibson Girl." He was born in Roxbury, Mass., studied at the Art Student's League, New York, under Saint Gaudens and Julian in Paris, and later went to London and Munich for further work. He first achieved prominence by his illustrations in *Life*, the *Century*, *Scribner's* and *Harper's* magazines. He is acknowledged as one of the greatest living masters of black and white, and is perhaps best known through his humorous, inoffensive ridicule of the shams of society. At one stage in his career *Collier's Weekly* secured exclusive control of his services for a year at a salary of $100,000. Some of his published works are *The Education of Mr. Pipp*, *A Widow and Her Friends*, and *People of Dickens*. In 1905 he discontinued illustrating for a time and attempted by study in Europe to master color work, but he has since returned to his former field of endeavor.

CHARLES DANA GIBSON

GIDEON, *gid'e un*, the fifth judge of Israel, who was called by an angel of God to deliver his people from the Midianites, who were oppressing them. Going to battle with only 300 followers, each armed with a sword, trumpet and earthen pitcher containing a lamp, he gained a splendid victory, with God's help, by attacking the enemy's camp at night (*Judges* VII, 19). Gideon long remained one of the favorite heroes of the Jews.

Gideon's Band, a society of Christian commercial traveling men, formed at Boscobel, Wis., in 1899 to promote the work of God by holding meetings in hotel lobbies and various churches. They publish a monthly magazine, *The Gideon*, in Chicago, and in 1908 began putting Bibles in the guest rooms of hotels. This work has grown until, at the present time, nearly 300,000 Bibles have been placed, mainly in the United States, although they are extending their work to Canada and England. It is planned ultimately to place a Bible in every hotel room in every English-speaking town or city.

GILA, *he'lah*, a river of the United States which has its source in the Sierra Madre Mountains in New Mexico and flows in a westward direction through mountains and valleys, across Arizona. The ruins of stone edifices, pieces of broken pottery and indications of irrigation canals along the banks of the Gila show that the region was formerly inhabited by a partly-civilized race, the historically interesting and mysterious Cliff Dwellers (which see).

GILA MONSTER, a poisonous lizard, one of the largest of the lizard family in North America, is found in the deserts of Arizona, New Mexico and Texas. It derives its name from its discovery near the Gila River in Arizona.

GILA MONSTER

It is covered with orange and black scales, and has grooved teeth with poison-secreting glands near their base. The bite of this lizard was formerly supposed to be injurious to man, though rarely fatal, but deadly to small animals and birds. Scientific investigation has failed to verify this opinion, so the question of the venomous nature of the reptile is still unsettled.

GILBERT, Sir Humphrey (1539-1583), one of the earliest of North American colonizers, first won fame as an English navigator and explorer. During early manhood he attained distinction in the English army. In 1578 he received a commission from Queen Elizabeth to conduct an expedition in search of a new route to India, in which little known land he had become interested. The history of this voyage is obscure, but it availed nothing, as he returned to England the next year, having lost one of his chief ships and one of his bravest captains. Undaunted, however, he started out in 1583 in command of a second expedition, with his half brother, Sir Walter Raleigh. But Raleigh and his ships deserted him soon after their departure from Plymouth. Gilbert this time succeeded in planting a colony near Saint John, Newfoundland. After taking formal possession in the queen's name, he proceeded southward, encountered a storm and was never heard from again.

GILBERT, Sir William Schwenk (1836-1911), an English dramatist who, in collaboration with Sir Arthur Sullivan, a composer, produced some of the world's most popular light operas. Among these are *Pinafore, The Mikado, The Pirates of Penzance* and *Patience*. Theirs was the most successful artistic partnership in history.

Sir Gilbert, who was born in London, studied at London University and later was admitted to the bar. He was knighted by King Edward VII in 1907. When *Fun* was first published in 1861, he secured in it a popular reputation, chiefly by reason of his *Bab Ballads*. His first writing for the stage was entitled *Dulcamara; or, The Little Duck and the Great Quack*. However, his real success began when he entered into a producing partnership with Sir Arthur Sullivan. Their first operetta was *Trial by Jury*. Then followed the five above-mentioned operas, which ever since have delighted theatergoers because of their clean, wholesome, delightful fun, their sparkling wit and tuneful melodies. The Savoy Theater, in London, was built especially for the Gilbert-Sullivan productions. *Pinafore* became almost a world-wide production. At one time ninety companies throughout the United States alone were singing it.

The partnership continued until the death of Sullivan, in 1900. See Sullivan, Sir Arthur.

GIL'DER, Richard Watson (1844-1909), a poet, editor, orator and lover of art, one of the most popular of Americans because of the purity of his patriotism and his tireless endeavor to serve his city and his fellow men. Born at Bordentown, N. J., in early life he planned to follow the legal profession, but the War of Secession made of him a soldier. At its close he entered the field of literature.

At the age of twelve he published a little paper, which he not only wrote but set up and printed himself. He helped to establish the Newark (N. J.) *Morning Register,* and then in New York City became editor of *Hours at Home*. This periodical was merged into *Scribner's Monthly,* and he became its managing editor; and when the latter was changed to the *Century Magazine,* he became the editor-in-chief, which position he filled until his death.

On a par with Mr. Gilder's activities as an editor ranks his work as a poet, and some of his best efforts have been collected in *Five Books of Song, In Palestine* and *Poems and Inscriptions*. Although a poet rather than a man of affairs, he always took an active interest in matters of public welfare, and became the head of several reform organizations. He was the first president of the New York Kindergarten Association, and one of his most significant services to his city was his devotion to the children of the tenements.

GILD'ING, the art of applying gold leaf or gold dust to metal, porcelain, wood, paper or glass. The oldest and best method consists in applying gold leaf to a surface previously treated with sizing, which acts like a glue when partly dry and firmly holds the gold leaf. When applied to cardboard or paper, their surfaces must first have another sizing, to prevent them from absorbing the regular sizing, so the gold leaf will adhere. The frames of mirrors, pictures and moldings are gilded with gold leaf, or a silver leaf to which a yellow varnish is afterwards applied. The edges of books are gilded by coating with glue, preferably fish glue, applying the gold leaf and afterwards polishing.

In gilding ivory a warm sizing is used. In gilding glass, china and pottery gold dust is mixed to form a paint, and this is applied with a brush. The article is then baked in an oven at a low temperature, and later put in a kiln at a high temperature, to secure permanency. If such dishes are washed in soap a great deal and not very well rinsed, the alkali in the soap will gradually eat off the gold. In the gilding of iron and steel, gold leaf is sometimes applied after the surface has been well cleaned and heated until it turns a bluish color. In Saint Peter's Cathedral at Rome and the Congressional Library at Washington, D. C., gilding forms one of the chief interior ornamentations; the dome of the State House in Boston is entirely covered with gold leaf.

GIL'EAD, the mountainous country east of the Jordan River, where the tribes of Gad, Reuben and a part of the tribe of Manasseh settled when the Israelites took possession of the Promised Land. It was a splendid pasture, extending from the table-land of Moab north to the River Yarmuk, and became the refuge for many who disagreed with the government during the history of Israel. It was the refuge for Absalom when he fled from his father. Here, too, the Christians found safety when Jerusalem was besieged. A famous balm, obtained in this country from nuts, was used as an ointment and was considered very precious. The expression, "Is there no balm in Gilead" (*Jeremiah* VIII, 22), really means "Is there no place of refuge" and does not refer

to the ointment such as Jacob sent to his son Joseph in Egypt (*Genesis* XLIII, 11).

GILLETTE, *jil et',* William Hooker (1855-), an actor of unusual gifts and one of the foremost American dramatists. He is best known by his characterization of the title rôle of *Sherlock Holmes,* which he dramatized from Sir Conan Doyle's stories of that hero. He was born in Hartford, Conn., the son of a United States Senator. While playing in stock companies in New York and Boston he took special courses at the University of New York and the Massachusetts Institute of Technology. He began his theatrical career in 1877, and soon after started writing his own plays. In *Secret Service* Mr. Gillette carries the War of Secession theme, which he began with *Held by the Enemy,* to the highest point such plays have reached. Two of the best plays recently produced in the United States are his *Secret Service* and *Sherlock Holmes.* Others of his plays are *The Private Secretary, Esmeralda* and *Because She Loved Him So.*

GILLS, *gilz,* the breathing organs of fishes, located in chambers, one on each side of the head. If the throat of a fish be examined, a series of four or five slits, called gill-openings, may be seen. These open to the exterior; the fish opens its mouth at regular intervals, draws in a quantity of water, contracts the sides of its throat when it closes its mouth, and thus forces the water through the gill-opening, over the tiny gill-filaments to the exterior. When the water passes over the gill-filaments the oxygen is extracted from it by the blood in the filaments and is carried to other parts of the body. In sharks these outer openings may be seen, but in bony fishes the chamber on each side of the head is covered by a bony plate. For illustration, see Fish.

GIL'MAN, Daniel Coit (1831-1908), an American educator and the first president of Johns Hopkins University, was born at Norwich, Conn. He was graduated from Yale College in 1852 and continued his studies in Europe, in Cambridge University and in Berlin. In 1872 he became president of the University of California, and in 1875 was elected first president of Johns Hopkins University at Baltimore, where he remained until 1901. The Carnegie Institution in Washington, D. C., also chose him as its first president in the latter year; he resigned this position in 1904. From 1893 till 1901 he served as president of the American Oriental Society, and The Russell Sage Foundation for Social Betterment appointed him a trustee in 1907. He was also vice-president of the Archaeological Institute of America. He published *Launching a University,* an account of the early years of Johns Hopkins, *Life of James D. Dana,* the geologist, and *Life of James Monroe.* Dr. Gilman was also one of the editors of the first edition of the *New International Encyclopedia.*

GIL'MORE, Patrick Sarsfield (1829-1892), one of the most popular of American musical conductors, was born near Dublin, Ireland. At an early age he left his native land for the United States, and soon after organized Gilmore's Band. In 1869 he arranged the National Peace Jubilee in commemoration of the close of the War of Secession in America, and in 1872 the World's Peace Jubilee, after the close of the Franco-German War in Europe. On the latter occasion he conducted an orchestra of 2,000 pieces and a chorus of 20,000 voices. Later he organized the famous Twenty-Second Regiment band in New York, which gave popular and successful concerts in the United States, Canada and Europe. He devoted little time to composing, his only work of note being an anthem entitled *Columbia* and intended as a national hymn.

GIN, *jin,* a liquor distilled from grain. The name is derived from *jenever,* the Dutch word for the juniper plant, the berries of which are used to flavor the spirit. By far the larger part of the spirit is made in Holland where it is treated in different ways and sold under various names. The ordinary gin sold in the lowest class of drinking places consists of alcohol flavored with salt and oil of turpentine, and diluted to alcoholic strength of from twenty-five to forty-eight per cent.

GINGER, *jin'jur,* a valuable and favorite seasoning and confection, with a warm, burning taste, obtained from the rootstalks of the ginger plant. Though native to the East Indies, ginger has been introduced into the West Indies, South America and West Africa. From the knotty rootstalks grow grasslike leaves and cylindrical stems bearing clusters of white, purple-streaked flowers. When the leaves wither the roots are dug and dried whole to produce black ginger, or scraped, washed and dried to produce white ginger. If it is to be preserved it is boiled and dipped in sirup every twenty-four hours for a week. The finest ginger is obtained from the island of Jamaica and is generally sold in the form of an extract. Most of the preserved ginger is imported from China.

Uses. As a spice, ginger is well known to everyone from earliest childhood, through gingerbread men and ginger snaps. And later we meet it in that home remedy, ginger tea, or candied, or in the popular beverage, ginger ale or ginger beer. Ginger wine is a cheap liquor flavored with ginger. The oil of ginger is used to lessen pain. Its commonest use is in seasoning a great variety of foods.

THE GINGER PLANT

Wild Ginger, found in the woods throughout the United States, is a low, woolly plant with beautiful heart-shaped leaves, and one dully-colored, bell-shaped blossom growing close to the ground. A popular remedy for measles and whooping cough is made from the roots of this wild plant.

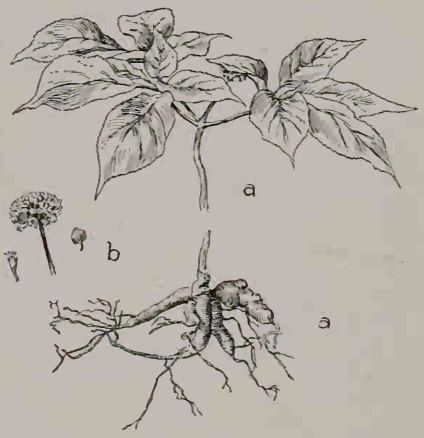
GINGHAM, *ging'am,* originally a smooth, close cotton fabric, woven of two colors of plain-dyed yarns, into checkered, striped and fancy patterns. A greater variety now appears in ginghams than formerly, and they are also woven of silk and cotton mixed, or of silk and ramie. Ginghams were first made in India, but now about 550,000,000 yards of gingham, valued at $40,000,000, are manufactured yearly in the United States alone—an average of over $130,000 worth each working day.

Gingham differs from calico in that the colors are woven with the fabric, not printed on it, as is true of calico, so the cloth is alike on both sides. The name is probably derived from the Japanese word meaning *perishable,* or *fading.*

GINKGO, *gingk'ko,* the beautiful "maidenhair" tree, used so extensively for ornament. It is a very hardy tree as far north as the latitude of Massachusetts and sometimes grows to a height of 100 feet, while the trunk reaches a diameter of eight feet. Its leaves are fine, like those on a maidenhair fern, from which it received its popular name. In Washington, D. C., several streets have been made very beautiful by the planting of many of these trees. For centuries it has been cultivated in Japan and China as a sacred tree in the groves of the temples. The Chinese use the starch kernel of the seed as a food, for it tastes much like an almond.

GINSENG, *jin'seng,* the light-yellow root of a low, wild herb, prized by the Chinese as a remedy for nearly all diseases. The plant, with its three or five leaves and inconspicuous flowers which change to scarlet berries, is found in America from the valley of the Saint Lawrence to the mountains of Georgia and west to the Mississippi; it is also cultivated in China. Some of the roots are shaped a little in the likeness of a human being, and so the name was derived from Chinese words which mean *likeness of a man.* Roots of such shape bring high prices from the superstitious Chinese. The plant is little used by Americans, but when they learned of the demand for it in China it became a valuable article of export, the price per pound rising from 52 cents to as high as $10. The supply of the wild root becoming exhausted, the cultivation of ginseng has been encouraged.

Ginseng will thrive in a soil which is rather loose, well drained and rich in humus, potash and phosphoric acid, but not in nitrogen.



GINSENG

(*a, a*) Top and roots of mature plant; (*b*) flower cluster and its parts.

Since exposure to the full heat of the sun will kill it, ginseng-growers who cultivate the plant in the open protect their crop by erecting a lattice-work covering. Posts six feet high are placed along the beds at intervals of sixteen

feet, and to these are fastened, both at the sides and across the tops, two-inch boards, two inches apart. The effect of the sun is therefore diminished about fifty per cent. Ginseng

PRODUCTION OF GINSENG

The average annual value of the crop in the four states which lead in its cultivation.

is planted in beds, six inches apart each way, and it takes six years to reach maturity. Thus, to make sure of having a continuous crop, the grower must plant a new supply each year. Each root weighs about two ounces after drying. M.S.

Consult Kain's *Ginseng;* Harding's *Ginseng and Other Medicinal Plants.*

GIORDANO, *jor dah' no,* Luca (1632-1705), an Italian painter and son of an artist, born at Naples, nicknamed Luca Fa-presto (Luke Work-fast), and The Thunderbolt. At the age of eight he painted a cherub into one of his father's pictures, a feat which induced the viceroy of Naples to recommend the child for study under Spagnoletto.

In 1687 Charles II of Spain invited him to come to Madrid, where he remained for thirteen years. An anecdote which shows the rapidity with which he worked relates that while the Queen of Spain was in his presence one day he proceeded to paint a portrait of Her Majesty into the picture on which he was engaged. While at Madrid he painted the main staircase at the Escurial, and ornamented a church. After the death of Charles, in 1700, Giordano returned to Naples, having already amassed great wealth. He spent huge sums in acts of munificence and was particularly liberal in his aid to the poorer brethren of his art. He left a vast number of works to his credit, among which are *Christ Expelling the Traders from the Temple,* now in the Naples gallery; frescoes of *Moses and the Brazen Serpent* at Pavia; *The Judgment of Paris* in the Berlin Museum; and some fine paintings in the Dresden galleries.

GIORGIONE, *jawr jo' nay* (1477-1511), one of the most renowned of Italian painters, the first Venetian to handle brush and colors freely. It was he who modified the older method of the Venetian school and prepared the way for its final form as represented in the works of the greatest Venetian master, Titian.

His real name was Giorgio Barbarelli, but by his contemporaries he was called Giorgione, meaning "George the Great," because of his tall figure, his intense love for beauty and greatness of mind. He was much employed in decorative painting, having ornamented the façades of several large buildings in Venice with frescoes, but because of climatic conditions and effects of time these have now mostly perished. His pictures are rare, and there is a diversity of opinion among the best judges concerning the genuineness of many assigned to him. *The Concert,* in the Pitti Palace, Florence, is one of his most beautiful works; among other paintings of this master are *The Holy Family,* in the Louvre, Paris; *Jacob Meeting Rachel,* in the Dresden gallery; *Finding of Moses,* in Milan, and *The Sea Storm,* in the Academy of Venice.

GIOTTO, or **GIOTTO DI BONDONE,** *jawt' toh de bohn doh' nay* (1276-1336), a painter, sculptor and architect who occupies a prominent place in the history of Italian painting. This estimate of him is especially true, if one considers that during the time in which he lived the resources of his art were still in their infancy and that all he was able to achieve was with the limited means of the times. He laid the foundations upon which all the progress of the Renaissance was afterward firmly based.

Cimabue noticed the young shepherd boy engaged in drawing on large, flat stones. He immediately made the youth his pupil and placed him where he could benefit the world. His greatest architectural masterpiece is the Bell Tower of the Cathedral at Florence, commonly called Giotto's Tower, exquisite in design and rich in decoration. This was unfinished at the time of his death, but he left a perfect model, and it was completed by his pupils. His principal works were his fresco paintings, usually in series, found in all the large cities of Italy. He was a friend of Dante, and his portrait of the poet painted on the wall of the Palace of the Podesta at Florence, recently restored, is one of his most famous works. Twenty of his smaller paintings are to be found in the Florence Academy, two in

Berlin and four in private collections, which originally formed a series of twenty-six illustrative of the lives of Christ and Saint Francis—that is, representative of the circumstances in the two lives which seem to have had certain likenesses. A mosaic of the *Navicella*, or Christ saving Saint Peter from the waves, is now preserved in the portico of Saint Peter's Church at Rome.

GIPSY, *jip'sy*. See GYPSY.

GIRAFFE, *ji raf'*, or **CAMELOPARD**, *ka mel'o pard*, the tallest of all animals, a full-grown male being eighteen feet high, three times the height of a tall man. It is found only in Africa, and is a shy, forest-loving, cud-

THE GIRAFFE
In natural position, and when grazing.

chewing animal which feeds on grass and leaves of trees. The Swiss naturalist Rutimeyer fittingly described it as "a most fantastic form of deer."

Its great height is due to an extraordinary length of neck, in which, however, there are but seven vertebrae. The body is short and slopes sharply down to the tail, which ends in a tuft of hair, and to the casual observer it seems that the front legs are longer than the hind ones; however, the long, slender legs, cloven-hoofed, are all the same length. On the long head are two ears of moderate size and two short, bony projections resembling horns. The upper lip, which extends far beyond the nostrils, and the eighteen-inch tongue lend help in the tearing of twigs and leaves from trees. The nostrils can be closed to guard against thorns when feeding, and against blowing sand. The eyes are large, lustrous and appealing, and so placed that the animal can see behind him, in front and at the sides. Excepting a short mane on the neck, a giraffe's hair is short and smooth. It is reddish white, marked with darker spots. Like several other animals of hot, dry countries, giraffes can exist for many days without drinking. When grazing, the animal stands with its front legs far apart, to bring its head nearer to the ground.

This animal, keen of smell, hearing and sight, walks very slowly, but when pursued runs so fleetly in a rocking, camel-like gallop it is not easily overtaken by a horse. But when once reached it is easily killed, and giraffes have been hunted so vigorously for their hides, which are made into whips in use all over South Africa, that they are now rarely seen.

The giraffe requires very careful attention and constant care in captivity or it will die. It is one of the animals arousing most interest in parks and zoölogical gardens, not only for its remarkable appearance, but for its amusing, hopping antics when playing.

The name camelopard is given because the animal is formed somewhat like a camel and is spotted like a leopard. The name *giraffe* means *to walk slowly*. M.R.T.

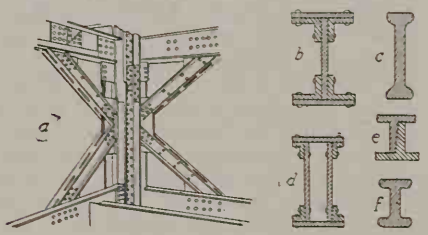
GIRARD, *ji rard'*, COLLEGE, a school founded in 1848 by the will of Stephen Girard at Philadelphia, Pa., for the education of the "poor white male orphan." He fixed the age of admission between six and ten, while the age of leaving is from fourteen to eighteen. At first, the institution was placed in trust of the city council of Philadelphia, but that plan was found impracticable, so it is now managed by the board of directors of city trusts, which includes the mayor. By one of the peculiar terms of the will "no ecclesiastic, missionary or minister of any sect whatsoever" can be employed in any capacity in the school. When it was organized there were 100 students, but now it has a capacity of 1,520. Forty acres of campus are inclosed by a ten-foot stone wall, and there are twenty buildings in addition to the main building. All branches of work up through high school and along mechanical lines are taught to fit boys for earning their own living. By wise investment the endowment of the school has increased to almost $29,000,000.

Stephen Girard (1750-1831), an American financier and philanthropist, was the chief

financial advisor of the United States government in the War of 1812 and at his death willed $5,000,000 to found Girard College. He was born at Bordeaux, France, the son of a sea captain, and at the age of twenty-three became a captain himself. In 1776 he settled in Philadelphia and after the Revolutionary War became much interested in the first United States Bank, buying most of its stock and buildings in 1812. This he made one of the soundest and most successful institutions in the United States, and in 1814 he took up almost an entire loan of $5,000,000 for the government. Later he became one of the principal stockholders and directors in the second United States Bank. He left his immense fortune to charitable and municipal institutions in Philadelphia and New Orleans.

STEPHEN GIRARD

GIR'DER, a beam, the two ends of which rest upon a pier, wall or other support and carry a load such as a floor or superstructure of a bridge. In buildings where great strength is necessary the girder may rest on an extra support in the middle, in which case it is known as a *continuous girder*. Wood, cast iron and wrought iron are occasionally used, but steel girders are fast superseding other material. The simplest form of girder is the solid I beam; a more complex and stronger beam is the compound I girder, in which the weight is spread over a larger surface at the two ends. A box girder is a solid beam with flanges connected by two web plates, resembling a large rectangular box. In order further to strengthen girders, braces are used at corners, as shown in (*a*) in the illustration. All steel girders are made in rolling mills, by methods similar to those employed in rolling rails for railroad tracks. See ROLLING MILL.



GIRDERS

(*a*) Perspective of a corner steel column, showing girders and wind-braces; (*b*) compound I girder; (*c*) I girder; (*d*) box girder; (*e, f*) wrought-iron girders.

GIRONDISTS, *ji ron'dists,* a political party in the Legislative Assembly and National Convention during the French Revolution (1791-1793). The name was applied because of the fact that the most brilliant exponents of its point of view were deputies from the district near Bordeaux called the Gironde.

Madame Roland, whose salôn became their gathering place, exercised a powerful influence on the spirit and policy of the Girondists, but such party cohesion as they possessed was due to the energy of Brissot, who was regarded as their spokesman in the Assembly and the Jacobin Club. They were distinguished for visionary ideals, rather than for a well-defined policy. They became an easy prey for the more radical Jacobins, and their overthrow was accomplished in June, 1793. See ROLAND DE LA PLATIÈRE, MADAME; JACOBINS; FRENCH REVOLUTION.

GIZZARD, *giz'ard,* a portion of the digestive apparatus found in certain animals, especially in birds, where hard, solid food is ground to fineness. The gizzard of birds is a muscular bag in the stomach, lined with a thick, tough membrane. Food first enters a pouch called the *crop,* where it is moistened in a fluid secreted there. Passing next to the stomach, it is mixed with gastric juice. It then goes into the gizzard, where it is crushed by the muscular action of the thick walls; gravel swallowed by the bird assists in the grinding process. Birds that eat grain have more powerful gizzards than those which eat insects, but in birds of prey the gizzard is only slightly developed. Among other animals possessing a gizzard are the earthworm, the crayfish and its allies, and certain insects. See POULTRY, for picture.

GLACE, BAY, *glase,* a coal-mining town in Nova Scotia, at the east end of Cape Breton Island. It is connected with Sydney, fourteen miles to the west, by the Sydney & Louisburg Railway. Glace Bay is the center of the Dominion Coal Company's properties, which yield most of Nova Scotia's output of coal and employ over 10,000 miners. From the harbor, which is on the Atlantic, coal is shipped to Canadian and foreign ports. There are fisheries and a rich farming district in the vicinity,

and the town has a Marconi wireless station, said to be the most powerful in the world, up to 1917. Population in 1901, 6,945; in 1911, 16,562. A.H.MC K.

GLACIAL, *gla'shal,* **PERIOD,** or **AGE OF ICE.** Boys and girls who live anywhere in Canada or in almost any part of the Northern United States can hardly believe that once, even though it was thousands upon thousands of years ago, their home land was covered with a vast sheet of ice. As they look about them on forests and streams and fields aglow with beauty their minds can scarcely picture so cold and forbidding a scene as a vast ice mass, over two thousand miles long and half as wide, where now millions of happy people live. When it is realized that in places the ice sheet was supposed to have been as much as a mile, and possibly more, in thickness, the fact seems the more astounding.

IN NORTH AMERICA

IN EUROPE

The solid line at the southern extremity of the glacier fields represents roughly the limits of glaciation.

The scientific men who tell of this strange age agree that this so-called Glacial Period was that period in the formation of the world in which the change was made from the most recent past to the present era. For this reason the Glacial is also called the *Pleistocene* Period, a term derived from two Greek words meaning the most recent period back of the Age of Man.

The chief characteristic of the Glacial Period was the great ice sheet, which covered over 8,000,000 square miles of the earth's surface. Fully one-half of this ice-covered area was in North America. With the exception of most of Alaska all the northern part of the continent, including all of Canada, was enveloped in ice. The southern boundary of the ice field was marked by the Ohio and the Missouri rivers. In the east the ice sheet included all New England, New York, the northern part of Pennsylvania, and west of the Appalachian Mountains all the states of the great Mississippi Valley as far south as the Ohio River. All of Minnesota, most of North Dakota, the northern part of Montana and Washington and all of Iowa, the eastern parts of South Dakota and Nebraska, with a small portion of Kansas, and more than half of Missouri were also included.

Movement. In Europe the Scandinavian Peninsula, all the lowlands of Belgium, Germany, Denmark, Holland and Russia were under ice. The glaciers of the Alps extended much lower than at present, and a good portion of the British Isles was covered with glaciers. Ice sheets of smaller areas existed in Asia and South America. In North America this great ice sheet gathered around three centers: one in Labrador, east of Hudson Bay; the Keewatin center, west of Hudson Bay; and the Cordilleran center, east of the Rocky Mountains in Canada.

In the course of time the glaciers began to move from the three centers. In each case the movement was toward the lowest level, hence from each center the motion was in nearly all directions. Such was the power of the great mass of ice that it very naturally changed the

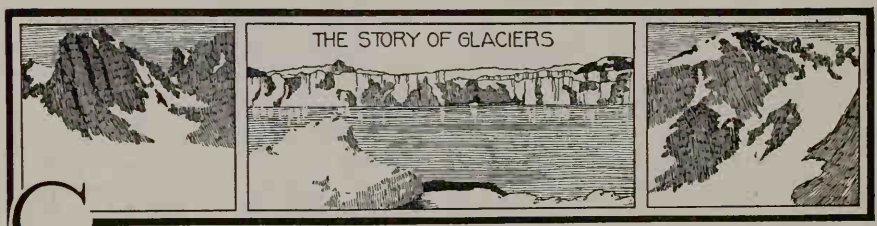
surface of the land. Hills were leveled, lake beds were filled up in some places and scooped out in others. Great masses of rock and gravel were carried by the glaciers and deposited along its course, forming drift. In some places in the states south of the Great Lakes this drift forms ranges of low hills from 200 to 250 feet high.

The fine silt deposited on the prairies of the Mississippi Valley and constituting the fertile soil of this region was also another result of this movement. In some localities the rocks were stripped bare of soil, and their surfaces were polished and marked. Lakes were formed in regions where they had not been before, and in other regions lakes were drained by having their outlets lowered. The fertile regions in the lowlands of Europe were formed in the same way.

Life. In parts of North America the mammoth, the mastodon, the glyptodon, the woolly rhinoceros and other large animals roamed over the land. (These animals are described in this set of books.) Similar animals, if not the same, were found in Europe. In South America there were numerous gigantic sloths. There is no evidence that man lived in America, but some geologists think that he lived in Europe during the period. Both plant and animal life changed its habitat with the change of climate. Many present conditions can be explained only by reference to the Glacial Period.

Causes. Many theories have been advanced to account for the Glacial Period, but none is satisfactory. The following are those most generally advanced: (a) that a sudden elevation of the northern continents caused a fall in temperature; (b) that a change in atmospheric and oceanic currents caused such heavy rainfall as to cause the glaciers; (c) that the Period was due to a relative change in position of the earth and sun. See GEOLOGY; MORAINE; GLACIER. W.F.R.

Consult Dawson's *Canadian Ice Age;* Wright's *Ice Age in North America;* Bonney's *Ice Work, Past and Present.*



GLACIER, *gla'sher.* Imagine a great river stretching from near the summit of a lofty mountain down its sides for thousands of feet—a river, not of hurrying, sparkling, limpid water, but of solid ice, with a movement so slow that its pace is measured in inches per day rather than in miles per hour.

Some of the snow which falls high up on the mountains is lost by evaporation; in certain altitudes some is melted and in the form of streams begins to run through ruts and gullies down the mountain sides. However, most of this escaping water soon freezes into a long, solid river of ice, and when thick enough begins by its great weight to move in a mass very slowly down towards the valleys. This slow movement, usually less than two feet a day, continues until a point in its descent is reached when evaporation and melting offset the supply from higher regions. At this point the glacier proper ends and rivers begin, if the location is inland. If the end of the glacier is at the sea, great masses of glacial ice may break off and drop into the sea and become icebergs. Such, in brief, is the word picture which may be drawn of this majestic, awe-inspiring spectacle.

Glaciers are always formed wherever more snow falls than melts during the year; consequently they are found in cold climates like those of the polar regions and on the summits and slopes of high mountains in the temperate and tropical latitudes. The best-known glaciers are those of the Alps in Europe and those of the Rocky Mountains in the United States, Canada and Alaska. They are also found in the Scandinavian Peninsula, in the Andes and the Himalaya Mountains; on Greenland and other islands in the Arctic Ocean and on the Southern Alps in New Zealand.

In North America the largest glaciers are found on the shores of Glacier Bay and around Mount Fairweather in Alaska. There are also

extensive glaciers around Cook's Inlet. Compared with these Alaskan glaciers those of the Alps are mere rivulets. The Malaspina, on Yakutat Bay, Alaska, is 1,550 feet high and has an area of 600 square miles; the Valdez, on Prince William's Sound, is fifteen miles long; the Muir, named for John Muir, at the head of Glacier Bay, is 200 feet high and has a frontage of three miles on the coast. All the valleys of the Northern Alaskan coast are filled with ice rivers, and the fiords of this region were formed by the action of glaciers.

In Glacier National Park, Montana, and in Rocky Mountains Park, just to the north, in Canada, are numerous glaciers which can be easily reached and are interesting to study. Enormous glaciers are also found in the Selkirk Mountains in British Columbia, along the line of the Canadian Pacific Railway. These glaciers are visited by thousands of tourists every season. The most noted glaciers of Europe are the Mer de Glace on Mont Blanc and those on Mont Rosa.

Structure. Glaciers are formed by the freezing and pressing together of masses of snow. After snow has lain upon the ground for some time, the flakes lose their form and the snow becomes granulated, as we see it in snowdrifts in the spring. On the mountains where snow remains from year to year this granulated snow becomes frozen into a porous ice which the French call *neve,* the name generally given it by geologists, but which we call glacial ice. A layer of glacial ice is formed each year, and the lower layers become more compact than the upper, so these lower layers more closely resemble ordinary ice.

Crevasses. The irregular surface over which the glacier moves often causes the ice to crack and form crevasses, which are sometimes more than 100 feet deep. Since these are often filled with light snow they are very dangerous to travelers. The sun melts the ice at the top of the crevasse faster than it does that below, hence the crevasse becomes wedge-shaped and continues to increase in size. Sometimes the crevasses are closed by the movement of the glacier.

Surface. The surface of the glacier becomes very irregular. This is due to the crevasses, to stones and other materials which the glacier gathers as it moves down the mountain and to irregularities due to the unequal melting of the ice. The porous ice melts much faster than that which is more compact, and in time the surface is covered with hollows and slight elevations. Stones shield the ice from the rays of the sun; so wherever they are lodged there are irregular surfaces.

Terminal. The lower end of the glacier is usually very steep, and from under it there issues a stream of ice-cold water formed by the melting of the glacial ice.

Movement. A glacier is the slowest-moving solid body in all the world; it moves down the valley very much as a mass of tar almost solid would move down an incline. The upper and middle parts of the stream travel the fastest, the sides and bottom being held back by friction on the sides and bottom of the valley. The rate of motion can be measured by measuring the movement of any object on the surface. It usually is from eighteen to twenty-four inches a day. The lower end of the glacier may move up the valley in summer and down in winter; or it may remain stationary. This depends upon the rapidity with which the ice is melted. When the end of a glacier juts so far into the sea that it breaks off from the main body the mighty fragment forms an iceberg, which then floats down from the frozen north towards civilization to become a menace to navigation. The story of an iceberg is told under that title.

Moraines. On its way the glacier gathers rocks and other material, which usually form lines which may be tracked through the mass; those near the sides are known as *lateral,* and those toward the middle are *medial,* moraines. The debris deposited at the end of the glacier forms the *terminal* moraine.

Erosion. As a glacier plows its way down the valley it carries along with it all the loose material on its bed. Thus it deepens the valley, lays bare the rocks and polishes them and marks them with *striae* (scratches). The work of erosion now performed by glaciers, however, is inconsiderable. E.S.

Consult Gilbert's *Glaciers and Glaciation;* Hobbs' *Characteristics of Existing Glaciers;* Russell's *Glaciers of North America.*

Related Subjects. The following articles in these volumes will be interesting and helpful in connection with the above:

Erosion	Icebergs
Fiords	Malaspina Glacier
Geology	Mer de Glace
Glacial Period	Moraine
Glacier National Park	Muir Glacier

GLACIER NATIONAL PARK, one of the most beautiful of the American national parks, reserved for the pleasure and recreation of the people. The region is one of romantic beauty;

it has been well said that "there is more geography to the square mile than can be found in any other equal area anywhere else on this round earth." It is situated in Northern Montana; on the north is the international boundary line between the United States and Canada, on the east is the Blackfeet Indian Reservation, on the west is Flathead River, and the southern limits are marked by the line of the Great Northern Railway. Adjoining the park on the north is the great Canadian forest and game preserve, the Rocky Mountains National Park.

The area included in the park, about 1,400 square miles, was once set aside by the government as a part of the Blackfeet Indian Reservation. Later it was taken from the Indians, with their consent, because it was believed that further explorations might disclose valuable mineral deposits. This hope, however, was not realized, and finally by act of Congress in February, 1910, it was set aside as a national recreation ground.

The Glaciers. The park takes its name from the glaciers, about sixty in number, which vary in size from a few acres to several miles square. Blackfeet Glacier, nearly five miles square, is the largest, and is said to be the most beautiful glacier in the United States. It is spread out, at an elevation of about 8,000 feet, on the north slope of Mount Jackson (10,023 feet) and Blackfoot Mountain (9,597 feet); on the south slopes of these mountains are the Harrison and Pumpelly glaciers. These glaciers are now separated by the Continental Divide, but ages ago they were a part of a vast ice-sheet which covered the entire region. About six miles to the west of Blackfeet Glacier is the Sperry Glacier, which discharges its melting waters over steep, almost vertical and rocky walls into Avalanche Basin. These are only the most notable of the glaciers; Rainbow, Grinnell, Sexton and Red Eagle are worthy of mention.

Mountains. The main range of the Rocky Mountains extends from north to south almost directly through the center of the park. The Continental Divide here has an average altitude of 7,000 feet, but many of the peaks reach 9,000 or 10,000 feet. Many of them have never been climbed by man. The loftiest peak is Mount Cleveland (10,438 feet), in the northern part of the park. Mount Jackson, Mount Siyeh and Stimson Mountain also have altitudes of more than 10,000 feet, while Mount James, Rising Wolf Mountain, Flinch Peak, Pinchot Mountain, Chief Mountain, Little Chief Mountain, Gould Mountain and a dozen others exceed 9,000 feet. Squaw Mountain, one of the smaller peaks, is so named because the rocky outline of a squaw is distinctly visible on its southern slope. Triple Divide Mountain (8,001 feet) is called the "roof of the Continent;" from its summit waters flow in three directions—northward through Saint Mary's Lake and River to Hudson Bay; westward through the Flathead River into the Columbia River and thence to the Pacific Ocean; and southward through the Cutbank, Missouri and Mississippi rivers into the Gulf of Mexico and the Atlantic.

One of the most impressive peaks is Going-to-the-Sun Mountain, whose summit towers a mile above the western end of Upper Saint Mary's Lake. The Indian name of this mountain is Mah-tah-pee O-stook-sis Meh-stuck,

LOCATION MAP

Glacier National Park is in Northwestern Montana. The star, across the international boundary, marks the location of Rocky Mountains National Park.

which means "The face of Sour Spirit, who went to the sun after his work was done." According to the legend Sour Spirit was a messenger sent by the Great Sun to the Blackfeet Indians. He taught them how to tan hides and build tepees and canoes, and instructed them in all the arts of Indian life. When he had finished his work, he returned to the Lodge of the Sun-God. As proof of the truth of this story the Indians point to the great stone face on the side of the mountain, left there by the Sour Spirit when he returned to the Sun, so that all men might see and believe.

Lakes. Of all the 250 lakes in the park perhaps the most beautiful is the Upper Saint Mary's, from whose western shore rises Going-to-the-Sun Mountain. It lies at an altitude of 4,500 feet, is about ten miles long, and is completely surrounded by mountains except at the point where the Saint Mary's River carries its surplus waters into the Lower Saint Mary's Lake. The Saint Mary's Lakes are on the east slope of the Continental Divide, but the largest lake, Lake McDonald, is on the west slope. It is eleven miles long, and has an average width

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IN GLACIER NATIONAL PARK. Above is Iceberg Lake. Below is a Blackfoot Indian camp on Cut Bank River.

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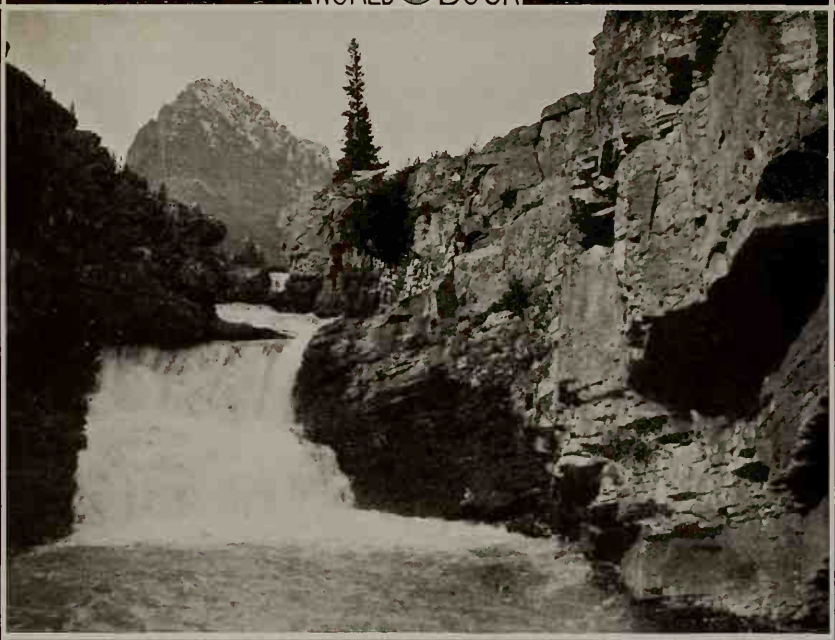


IN GLACIER NATIONAL PARK. McDermott Falls, above. Below: Going-to-the-Sun Chateau, on Saint Mary Lake.

of one and a half miles. Like Upper Saint Mary's Lake, it lies in a depression surrounded by great peaks rising 3,000 to 5,000 feet above its surface.

Lake McDermott, though one of the smallest lakes in the park, is also one of the most famous, for it is in the heart of a region of great beauty. In its waters are reflected the outlines of Gould Mountain and other peaks, and issuing from its southern end are the lovely McDermott Falls. Near the falls is a permanent camp, which is the headquarters for side-trips to Iceberg Lake, Grinnell Glacier and other points of interest.

Iceberg Lake is the only lake of its kind in North America. It is only one-half mile long, but it is one of the scenic features of the park. At one end is a small glacier, from which great blocks of ice, several hundred feet high and weighing thousands of tons, frequently break off and slide into the water. The altitude (6,000 feet) is so high that even on the warmest summer days there are always icebergs, large and small, floating in the lake, for the water never gets warm enough to melt the ice completely. Glacier National Park was once the "happy hunting grounds" of the Blackfeet Indians, but Iceberg Lake was thought to be the home of lost souls and troubled spirits.

Avalanche Lake, not far from Lake McDonald, is another beautiful, though small, body of water. The trail leading to it seems to emerge through a hole in the mountains, and discloses to the astonished traveler a green-bordered little lake, into whose quiet waters four streams tumble noisily. These streams, carrying the waters from Sperry Glacier, plunge almost headlong over a rocky precipice 2,000 feet high.

Animal Life. The animals of the park are protected by law, and killing, wounding or capturing any bird or wild animal is an offense punishable by heavy fines. For this reason the Rocky Mountain goats and sheep roam in peace, and many bears have become so tame that they wait on the outskirts of the camps to be fed. A few moose and elk also frequent the park, and deer are common. Antelopes, coyotes, wolves and lynxes abound, and geese, ducks and other game birds are sometimes seen in the lower altitudes. The streams and lakes are well stocked with fish, and the park deserves its name of "Fisherman's Paradise." One of the greatest fishing trips in the world may be taken from Belton, the western entrance to the park, down the Flathead River to Columbia Falls, a distance of twenty miles. Trout are found here probably in greater numbers than in any other waters in North America. The small, flat trout are caught everywhere in the park, and the large Mackinaw and bull trout are found mostly in Saint Mary's Lake. The gamest fighter of them all, and the delight of the angler, is the cutthroat trout. During June, July and August fly-fishing is the rule, but grasshoppers are sometimes used when the trout refuse to rise to a fly. In September, spinners are mostly used. All persons desiring to fish must first obtain a state license.

Transportation and Accommodations. There are two entrances to the park, the eastern at Glacier Park station, the western at Belton, both on the main line of the Great Northern Railway. Within the park trips may be taken on foot, on horseback, by stage-coach or by automobiles. There are many excellent roads, but the higher and remoter points are accessible only to pedestrians or horsemen. Launches are operated on Lake McDonald and Upper Saint Mary's Lake.

The accommodations for visitors are excellent, and suit all tastes and purses. A large modern hotel is located at the Glacier Park station, and dotting the entire area is a series of camps convenient to the points of scenic interest. These camps, which are placed not over a day's walk apart, are groups of small log buildings of the Swiss chalet type. Horses and camping equipment may be rented or purchased, and guides are available at all times. The charges for hotel accommodations and all other services are regulated by the United States government through the Secretary of the Interior, who has immediate control of all national parks. W.F.Z.

GLADIATORS, *glad'i a torz,* men of courage and strength, who, armed only with small shields and short steel swords, fought and killed each other, or placed themselves at the mercy of hungry wild beasts, in the days of ancient Rome. At first these contests were held in honor of heroes who died in battle, the earliest exhibition recorded being in 264 B. C., at the funeral of the father of Marcus and Decimus Brutus. There, prisoners, slaves or condemned criminals were sacrificed. At a later period freemen also fought in the arena, for hire or merely from choice; and still later men of senatorial rank, and even women, fought, and all to gratify the brutal passion

of the people of the day, who found entertainment in the shedding of blood. Schools for gladiators were conducted, and the practice grew to such proportions that it is said the warlike Roman emperor Trajan gave one show lasting over 100 days, during which 2,000 men fought to the death. Such exhibitions were finally abolished by Theodoric, in A. D. 500.

If a gladiator were overpowered in these contests the audience indicated, by pointing thumbs up or thumbs down, whether he should be killed or spared, there being a difference of opinion among authorities about the significance of the two signs. The victor, if a prisoner, sometimes received his freedom, at other times a palm or garland. One of the most famous gladiators of history was Spartacus, a Thracian slave, who incited the War of the Gladiators, 73-71 B. C. His story inspired that favorite American recitation, *The Gladiator's Appeal,* by Elijah Kellogg.

Among gladiatorial statues are the celebrated marble one in Rome, *The Fighting* or *Borghese Gladiator,* and *The Dying Gaul* or *Gladiator,* the original of which is in Paris. See COLOSSEUM.

GLADIOLUS, *gla di' o lus,* sometimes called the *humming-bird flower,* because those strange little birds seek it for nectar, is a popular hothouse and garden plant grown extensively in America and Europe. It is commonly grown

GLADIOLUS FLOWER CLUSTER

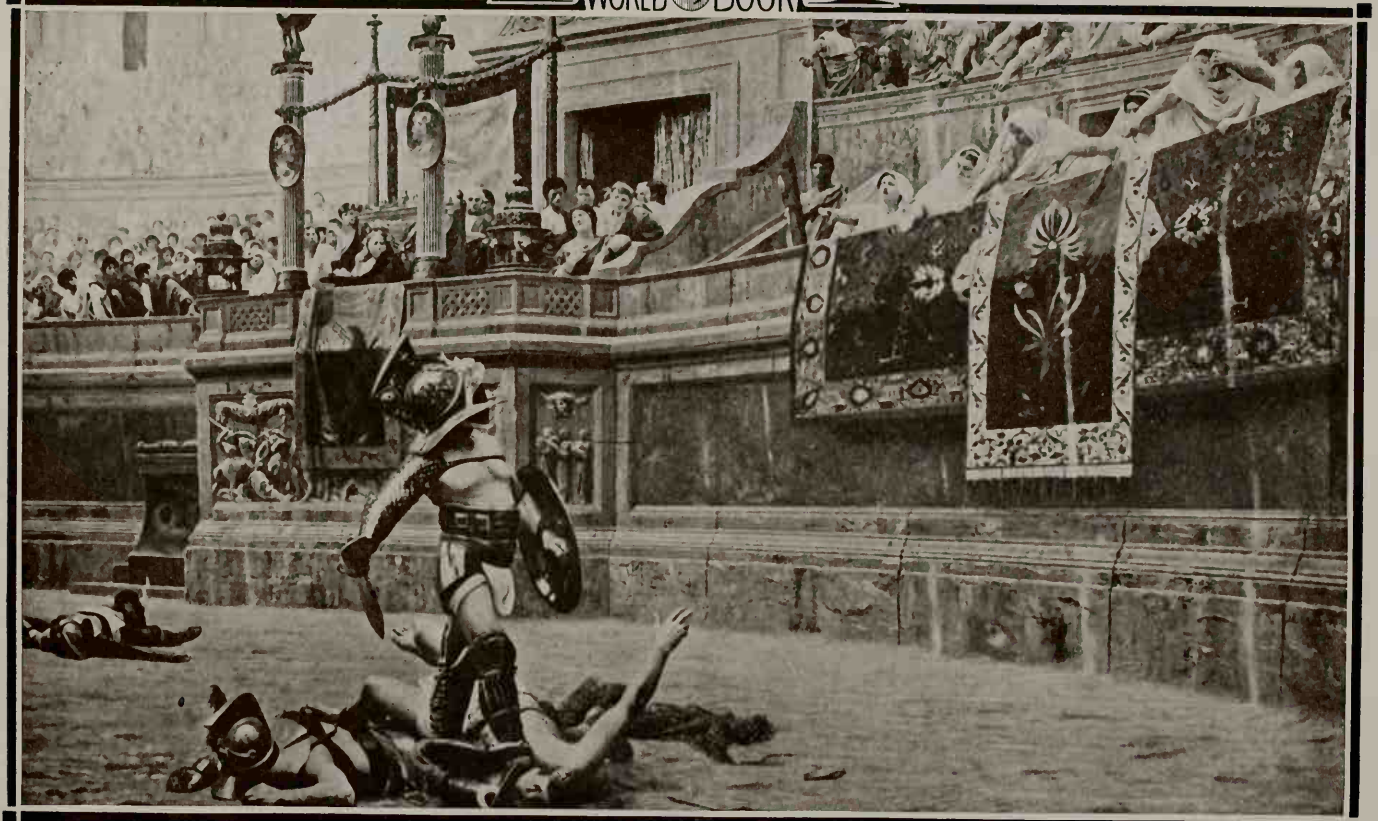
from the bulb, and will thrive in any good garden soil where it receives the full sunlight and free watering. The bulbs should be planted in succession at intervals of two or three weeks during March, April and May. The gladiolus may also be raised from seeds. These should be sown in March or April, and the plants be gathered in October. The little bulbs produced by the plants may then be planted the following spring.

The long, sword-shaped leaves gave the plant the Latin name for *dagger.* The large, irregular, tube-shaped flowers are arranged in long, one-sided clusters, the lower blossoms opening first. If a spike of gladiolus is cut when just the lower flowers are open the buds above will open in succession and keep fresh for a week or ten days. The colors range through all the shades and tints of red to white, and even a blue gladiolus has been produced. Luther Burbank has worked extensively with this plant, producing blossoms on all sides of the stem instead of on one side only, also larger flowers and rich combinations of color.

GLADSTONE, *glad' stun,* WILLIAM EWART (1809-1898), a profound British scholar and statesman, four times Prime Minister, and the most famous of the ministers and political leaders of the long reign of Queen Victoria. His name will forever be associated with those movements which are identified with the progress of English democracy—free trade, equal taxation, the education of the masses and the extension of suffrage—and he was the first Prime Minister to take up the fight for Irish Home Rule. He was born on December 29, 1809, in Liverpool, of Scotch parentage, and was educated at Eton College and at Christ Church, Oxford University. At the age of twenty-four he entered Parliament, where he gave his support to the Tory faction under the leadership of Sir Robert Peel. Between 1845 and 1847 he was Secretary of State for the Colonies in Peel's Cabinet, but during this period was not a member of Parliament. To that body he was reëlected in 1847.

WILLIAM E. GLADSTONE
The most powerful British statesman of the nineteenth century.

During the next few years, in which he was gradually swinging away from Tory principles to Liberalism, Gladstone rose steadily in power and influence, and as Chancellor of the Exchequer, a post which he held at three different times, he prepared budgets that showed his marvelous grasp of financial problems. In



THE GLADIATOR.

The vanquished is pleading for mercy; the victor awaits the sign from the multitude. "Thumbs down" seals the victim's fate. The picture is reproduced from Gérôme's great painting.

1865 he became the Liberal leader in the House of Commons, and three years later began his first term as Prime Minister. In 1869 he carried his bill for the disestablishment of the Irish Church, and in 1870 a bill for the reform of the Irish land system was passed. At this time, also, a system of public schools for the poorer classes was established, and the use of the ballot in voting was introduced. In 1874 the Conservatives regained their power, and Gladstone was succeeded in the Premiership by Disraeli.

Gladstone again came into prominence as a severe critic of the foreign policy of the Conservative Ministry, and in 1880, when the country was carried by the Liberals, he became Prime Minister a second time. During his second Ministry, which ended in 1885, about 2,000,000 new voters were given suffrage rights, and a fairer arrangement of Parliamentary districts was effected. Meanwhile, the movement for Irish Home Rule was making great progress, and when Gladstone became Premier for the third time, in 1886, he announced that Home Rule was to be a feature of the Liberal program. In April of that year the first Home Rule bill was introduced into Parliament. When it failed to pass in the House of Commons, Parliament was dissolved and in the resulting elections the Liberals were defeated. In 1892 the tide again turned and Gladstone took up for the fourth and last time the duties of the Premiership. In 1893 his second Home Rule bill passed in the House of Commons but was rejected by the House of Lords, and a year later, at the age of eighty-five, he laid aside the burdens of public life. Gladstone was the author of several books, among which are *Gleanings from Past Years* and *Studies on Homer and the Homeric Age.* B.M.W.

Consult Bryce's *Gladstone: His Characteristics as Man and Statesman;* Paul's *The Life of W. E. Gladstone.*

Related Subjects. The following articles in these volumes will throw light on Gladstone's activities, and on the history of the times in which he lived:

Budget	Liberal
Chancellor	Premier
Conservative	Tory
Disraeli, Benjamin	Victoria
Home Rule	

GLANDERS, *glan'derz,* a violent, infectious disease to which horses, asses and mules are liable, but which only occasionally attacks cattle, sheep and pigs. The disease was common among horses in the days of the ancient Romans, and no certain remedies have been discovered, even to the present day. The microbe which causes the disease was discovered in 1882. Various tests have been adopted by which to ascertain the presence of glanders; the injection of *mallein,* a substance prepared from the glanders bacillus, is the most effective test. It has no effect on a healthy animal, but if glanders be present a rise of temperature occurs.

In a chronic form the disease is easily distinguished. It usually begins with the formation of ulcers on the neck, shoulders and inside of the thighs. The nostrils discharge an offensive pus from the lungs, high fever sets in and death frequently results in from ten days to three or four weeks. The affected animal may live for years, however, with intermittent attacks, causing infection which may destroy hundreds of other horses. The chronic stage is known as *farcy;* but even in its milder state glanders proves almost equally infectious and destructive. To prevent its spread it is necessary to kill the afflicted animal and thoroughly disinfect stables, harness and everything with which it has come in contact. Dogs, cats and wild animals may contract the disease by eating the flesh of glandered horses, and men have been known to contract glanders by being brought in contact with infected animals.

Consult *Bureau of Animal Industries Bulletin 136,* United States Department of Agriculture, entitled "Various Methods for the Diagnosis of Glanders."

GLANDS, *glandz,* are specially-formed parts of the body, consisting of peculiar cells which manufacture or separate from the blood special substances which may be discharged from the body or be utilized for various purposes.

There are three varieties: *digestive,* or stomach glands, giving out digestive juice; *secreting,* or manufacturing glands, including the sweat, milk and oil glands; and *protective* glands, which absorb from the blood the poison of disease, thus cleansing the blood and protecting the body.

The digestive glands begin in the mouth and pour out a fluid (saliva) which changes starches into sugars; therefore food should be well chewed to give the digestive process a good start. In the stomach are those digestive glands (peptic and pyloric) which, aided by the churning action of the muscular walls of the stomach, pour their digestive fluid on the food, causing further changes; the partly-

digested food is then forced through the lower opening of the stomach (pylorus) into the intestine, where the fluids from the liver (bile) and pancreas still further digest; here absorption of the food largely takes place, the intestine being lined with cells which perform this work (see ABSORPTION).

The manufacturing glands are the sweat glands, which draw water from the blood and throw it forth in fine drops on the surface of the skin, in which they are located; the oil glands (sebaceous) which nourish and oil the hair and skin; and finally, the milk (mammary) glands, which make milk.

The protective glands are known as lymph glands, and are distributed over the entire body, becoming swollen and tender when they absorb poison from the blood, for the protection of the rest of the body. A very few glands are closed, or ductless, having no tubes leading into the rest of the system; the thyroid gland in the neck is tubeless, and on becoming enlarged causes the disease known as goiter (which see). J.H.K.

GLASGOW, *glas'ko*, next to London, is the largest city in Great Britain. It is the greatest and most important city in Scotland, and is situated on both banks of the Clyde, in Lanarkshire. Glasgow enjoys the reputation

LOCATION OF GLASGOW

of being the best-governed municipality in the world, and in all matters relating to municipal efficiency and economy it undoubtedly deserves this rank. When American or Canadian cities have wished to investigate municipal ownership of public utilities they have sent delegates to Glasgow to study its system.

Under authority granted by special act of Parliament the corporation constitutes what is called a "trust" for each department of city government. The police trust manages the police force, the market trust deals with market needs, and so on. All public utilities are municipally owned and are conducted by experts. The electric street railways, although hours of employees have been reduced and wages raised, with minimum fares of one cent, annually net a profit of over $300,000. The sanitary department includes the board of health; under its skilful management the death rate of the city has been reduced in a few years from thirty-eight per thousand to fifteen. (The lowest death rates in the United States are at Saint Paul, Minneapolis and Seattle, the first two only 11 and the latter 9.8 per thousand. The death rate for Toronto, Canada, in average years, is about 12 in a thousand.) The municipal lodging houses are models and are conducted so as to help the poor without making paupers of them. During recent years, by the abatement of the smoke nuisance, much has also been done to improve the general appearance of the city. Many streets have been widened and unsightly buildings have been destroyed. Glasgow is excelled in beauty by few British cities.

Situated in the midst of a district producing an abundance of coal and iron, with a splendid harbor accommodating vessels drawing twenty-six feet of water, and with excellent railway communications, Glasgow has many commercial advantages. It is the greatest center of shipbuilding and its allied industries in the world. The city's exports annually reach a value of nearly $163,000,000, as against imports of $83,000,000. Woolen, cotton, and linen goods, machinery, coal, paper, chemicals and whisky are the chief exports. Imports include raw products, iron, corn, timber, tobacco and petroleum. The water supply of the city is drawn from Loch Katrine, the lake referred to in Scott's *Lady of the Lake*, forty-two miles distant. The cathedral, erected in the twelfth century, is in the early English style of architecture, and is noted for its large and elaborately decorated crypt. Glasgow was founded in A.D. 560, but did not rise to any importance until about 1116. In 1300 William Wallace, the Scotch patriot, defeated the English there, and in the city in 1305 he was betrayed into the hands of his enemies. From the time of the union of Scotland and Ireland in 1707 Glasgow has steadily risen in commercial and educational importance. Population in 1911, 784,496.

University of Glasgow, one of the four great seats of learning in Scotland, founded in 1451

by Bishop Turnbull. It was endowed by Mary Queen of Scots and her son, James I of England. In 1864 new buildings were erected at a cost of $2,350,000, and further additions have been made at various times. The university is now a corporation consisting of a rector, chancellor, dean of faculties, principal and professors. It maintains departments and confers degrees in arts, science, medicine, surgery, divinity and law. Women are admitted, and in 1893 Queen Margaret College, incorporated into the university, was devoted to their sole use. The students numbered about 2,800 before the War of the Nations, in 1914, and of these 700 were women. F.ST.A.

Consult Howe's *A British City: The Beginnings of Democracy.*

GLASS, one of those familiar substances that are put to so many uses we take them quite as a matter of course. Yet, common as it is, glass adds more to our daily comfort and happiness than the costliest gems that the mines can yield. Our homes would be dreary places indeed had we no window-panes to give us light and through which to view the world about us, and no one would care to go back to the times when people drank out of gourds and horns instead of glass goblets, and used bottles made of skins.

Glass has become indispensable in the home, in the arts and in the commercial world. It is as much a source of comfort to know that our books are kept protected from dust behind the glass doors of our bookcases, as to be able to see the familiar titles and backs through the transparent casing. The scientist can add his testimony concerning the value of a substance which forms the lenses of the microscope and the telescope, and which is used in countless other devices and instruments. The merchant in the great city, who must utilize every available inch of space, transforms the basement floor of his huge establishment into a miniature department store, and solves the problem of light by having the sidewalks adjoining the building constructed of iron frames containing many glass prisms. In the lovely stained glass windows of the great cathedral and in beautiful vases and costly tableware we see something of the artistic possibilities of this very useful substance.

What Glass Is. Glass is not a natural substance, like gold, silver or coal, but is an artificial compound made by melting together certain ingredients at a very high temperature (from 1832° to 2732° F.). The principal materials used are: (1) sand (or crushed quartz or flint), (2) lime, and (3) sodium carbonate, or potassium carbonate or sodium sulphate. For various forms of glass other materials are added in varying proportions, such as manganese, cobalt, copper, zinc, tin, arsenic, saltpeter, etc.; pigments for coloring are also added. Cheap grades of glass are made from common sea and river sand, but for the manufacture of better qualities the sand is quarried. Lime is found in nearly all varieties, but lead oxide is substituted in making those which require a brilliant luster and a high degree of transparency, such as *flint* glass used for lamp chimneys, for cut glassware and for some of the lenses of optical instruments, and the *strass,* or *paste,* used in imitation diamonds. The lime has the effect of softening the glass, and the injudicious use of this material has caused many a beautiful piece of tableware to become tarnished and even ruined after a year of service. Potash-lime glass is much harder and less easily melted than soda-lime glass.

Processes of Manufacture. In preparing the materials which go into the making of the better grades of glass the manufacturer puts forth every possible effort to free the sand from impurities. In many cases it is stirred in great quantities of water, then burned in the flames of a fire, and, finally, sifted through copper gauze. Of the impurities which enter it, iron is the most troublesome; if there is

present over one-half of one per cent of iron in the sand the latter cannot be used for the manufacture of colorless glass. In the seventeenth century ground flint was used in the best glass, because it was purer than any sand then available. Hence the name *flint glass,* which, curiously enough, is to-day applied to a variety of glass that is extraordinarily soft, and in the manufacture of which no flint is used. The mixing of the ingredients into what the glassmaker calls the "batch" is a process that often requires the services of an expert chemist, and in the best modern factories it is customary to prepare the batch according to special chemical formulas.

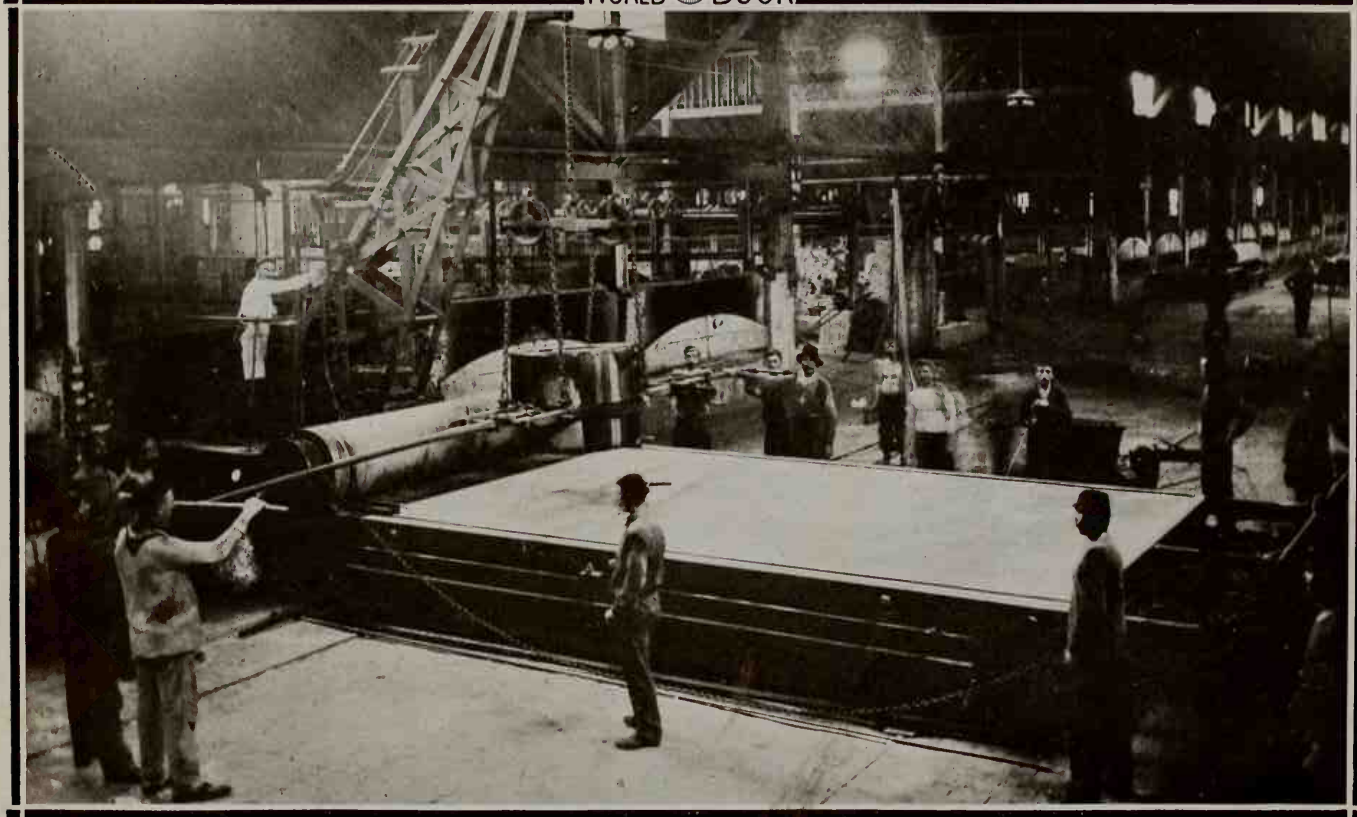
The melting furnace may be either of two general types—the *pot furnace* and the *tank furnace.* In the former the ingredients are melted in huge pots made of fire clay, arranged in a circle around a central fire, at the base of a huge chimney. As these vessels are very difficult to make and of uncertain durability, the tank furnace, heated by gas, has come into general use in the glass-making industry. This type of furnace is provided with a tank in which the ingredients are melted and from which the molten mass is drawn. In the largest factories these furnaces are seventy-five feet long, sixteen feet wide and five feet deep. They are usually worked without interruption, new material being fed into them at one end as the supply of melted glass is drawn out at the opposite end.

Window Glass. Window glass was formerly made entirely by hand labor, but in recent years machines for various steps in the process have been introduced. When performed by workmen the process is essentially as follows: For each part of the operation there is one man especially trained for the work. The first step is the gathering. The gatherer dips a long iron blowpipe into the white-hot glass, and skilfully forms on the end a mass of the substance, weighing from twenty to forty pounds. This ball of glass he turns in an iron mold until it assumes the shape of a pear, and then passes it to the blower, who is the master workman of the factory.

The blower, by a process of blowing, swinging and revolving the mass, shapes it into the form of a cylinder, sometimes as many inches long as himself. When it has cooled somewhat he holds the end of the cylinder in the furnace, blows into the blowpipe, and then covers the mouthpiece with his thumb. The air, thus imprisoned, and expanding with the heat, splits an opening in the end of the cylinder, which the blower enlarges by revolving the end swiftly in the furnace. When the hole is as large as the diameter of the cylinder, and the mass is cooled to cherry-red heat, an assistant detaches the glass from the blowpipe, and the cylinder is cracked lengthwise with a red-hot iron or a diamond on a long handle. The opened cylinder, with the split side up, is next placed on a fire-clay table which revolves in an oven. The heat soon flattens the cylinder into an irregular surface, which the next workman, the flattener, smooths out with a tool called the *polissoir* (French for *polisher*). This is an iron rod, to each end of which a block of wood is fastened. The smoothed sheet is next placed in the coolest part of the furnace and is then removed to the cooling stone. When rigid enough to be moved it is carried to the annealing chamber.

Annealing is for the purpose of preventing breakage when glass is subjected to changes of temperature, and all articles made from glass undergo this process. This breaking is due to the fact that one surface expands or otherwise dilates before the other has had time to be affected. The objects are slowly heated until the melting point approaches, and are then gradually cooled, the process taking place in a chamber having various compartments of different degrees of temperature. The principle is that the glass, which has been distended by heat, contracts evenly throughout as it cools, and the molecules have time to arrange themselves in a stable position. The glass therefore is made "tough."

Plate Glass, which is the most expensive form of window glass, is made by a special process. The ingredients are melted in huge, open vessels, or tanks, some of which have a capacity of two and one-half tons. These vessels rest upon frames behind fire-clay doors. When the melting has reached the required condition the tank is drawn out by a great fork mounted on a truck, and is rolled to the casting table. There it is hoisted by a crane, and the contents are poured over the metal bed. The molten glass is spread out uniformly by means of a heavy roller, and is then placed in the annealing chamber, where it remains for several days. It comes out in the form of rough plate, and must be polished before it is ready for service. Polishing is done by means of grinding machines which rub the surface with sand, emery and rouge, first on one side and then on the other. In this process



MAKING PLATE GLASS.

The sheet shown above is 8 x 12½ feet in size. The slightest flaw condemns the entire sheet if it is intended for a single pane.

about forty per cent of the thickness is eliminated, the resulting sheet being from one-fourth to three-eighths of an inch thick.

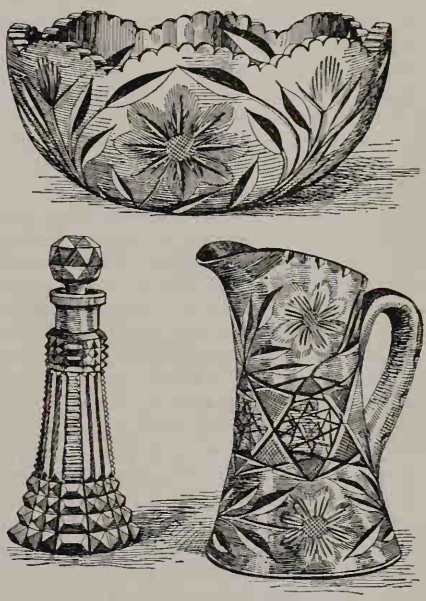
To make wired plate glass a wire netting is placed between the surfaces of the sheet while the glass is soft; the result is a strong, almost unbreakable pane, extensively used as a fire protection around elevator shafts and where there is danger from too close crowding of buildings. Basement and other windows that are liable to be broken easily are also frequently made of it.

Glass Tableware. A large part of the ordinary glassware that appears on the table is made by pressing. The press consists of an iron mold, containing the design and ornamentation of the article to be made, and a plunger which is worked by a lever. The gatherer places an iron rod into the molten glass, bringing out a quantity of the substance on the end of it. From this lump enough glass is cut to make the article, and the mass is dropped into the mold and pressed into shape by the plunger. When this process is completed the article is taken out and annealed. Some articles are made in two parts; in manufacturing a goblet, for instance, the bowl is shaped in one press and the stem in another. A good deal of the more expensive tableware is made by blowing. In many factories machines operated by compressed air take the place of the human blower.

Cut Glass is the most expensive and ornate tableware in use. The object is first cast in a mold or is blown, and its plain surface is then marked with the chosen design. It is next held against an iron wheel with sharp edges, which is mounted on a horizontal axis, and which cuts the design into the glass. The face of the wheel is kept supplied with coarse sand and water, which drips from a hopper above. It is not always necessary to trace the design before it is cut into the surface, for a workman of special skill and training is able to complete the work with only his eye for a guide. After the design is cut the article is held against a wheel of sandstone, which is so shaped as to have a sharp edge in the middle. The action of this wheel smooths the edges and surfaces made by the cutting wheel; during the process a small stream of water constantly plays upon it. A wooden wheel supplied with pumice stone next gives a finish and polish to the object, and it is finally cleaned by means of a brush made of spun glass. When all the tiny fragments of glass are removed from the grooves and crevices, the article is washed and is then ready for the market.

Bottle Glass. For the methods used in making bottles see the article Bottle, subhead *How Bottles Are Made.*

Colored Glass. Oxides of different metals, which are added in small quantities to the



SPECIMENS OF CUT GLASS

usual ingredients, give glass its various colors. Iron produces a pale yellow or a pale green; manganese, a pink, amethyst or violet. Copper gives a deep green or deep blue, but by adding a reducing agent to take the oxygen from the oxide, the metal copper can be set free in extremely minute particles. This imparts a ruby-red color to the glass. A still finer ruby glass is made by using gold in place of copper oxide. A rich blue is produced by cobalt oxide, a milky white by tin oxide, calcium fluoride or bone ash, and many beautiful tints by a combination of the various coloring substances. The exquisite stained-glass windows of many great churches are mosaics of different colored glass, cut and fitted so as to produce a complete design. On others the pictures are painted, and the colors are then burned into the glass. Colored glass, cut into small pieces, is sometimes seen in the ornamental mosaic work that beautifies the interior of public

buildings. Colored glass has the special virtues of holding its color and of not being subject to decay, and it is therefore a valued material for decorative effects.

Some Curiosities of Glass-Making. During the World's Columbian Exposition held at Chicago in 1893 an exhibition of spun glass created wide attention. This was woven into cloth from which was made a dress for the queen regent of Spain. White silk constituted the warp and glass the woof, and the fabric was woven on a hand loom. Spun glass is made by melting a glass rod in the flame of a blowpipe, and drawing the melted thread over a wheel which revolves at a high rate of speed. The iridescent effect seen in frost work on Christmas cards is produced by fine flakes of glass. Another interesting use of glass may be seen in the collection of "fadeless flowers" at Harvard University. There are in the collection 800 large models, representing sprays and clusters of flowers, and over 2,000 magnified parts. Every object is made of glass, and in color and form is an exact duplicate of the natural flower. The flowers were made in Germany by a secret process, and the collection is the only one of its kind in existence.

Historical. The origin of glass making is lost in antiquity. A fanciful story told by the Roman writer Pliny credits a band of Phoenician merchants with the discovery of the art. According to this legend, as the merchants were returning from Egypt they landed on the coast of Palestine, camped on a sandy beach of the River Belus, and there built a fire. Having placed some blocks of niter under their cooking vessels to protect them from the fire, they saw the substance melt, mingle with the sand and form a liquid stream of glass. Pliny, however, does not explain how the mild heat of an open fire could accomplish what to-day requires the intense heat of a modern furnace, so his narrative is regarded merely as an attempt to account for the origin of an art that had reached a considerable degree of perfection in Roman times.

Statistics of Manufacture. The United States imports yearly over $8,000,000 worth of glass; its exports are valued at about $3,800,000. There are about 365 glass factories in the country, engaging the services of nearly 75,000 persons. The capital invested represents a total of nearly $130,000,000, and a year's products have a value of over $92,000,000. The leading states engaged in the industry are, in order of importance, Pennsylvania, Ohio, West Virginia, Indiana, New York, Kansas, New Jersey and Illinois. The glass-making industry in America was greatly stimulated by the outbreak of the War of the Nations, for commerce with two of the greatest glass-producing countries in the world, Austria and Germany, was thereby interrupted.

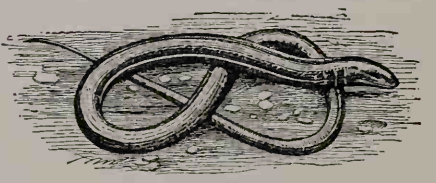
The Canadian provinces of British Columbia, Ontario and Quebec are the chief centers of the industry in the Dominion, the glass manufacturing establishments of which are capitalized at over $2,500,000. The value of the yearly output of manufactured glass is about $2,270,000; in addition, about $1,000,000 worth of stained, cut and ornamental glass is produced. J.F.S.

Consult Gaudy's *Romance of Glass Making;* Dillon's *Glass.*

Related Subjects. The following articles in these volumes contain information more or less closely related to the general subject of glass:

Annealing	Sand
Bottle	Stained Glass
Lime	Wire Glass

GLASS SNAKE, a harmless reptile, snake-like in form, but, like a lizard, with well-developed eyelids and ear-openings. This shining creature of brightly-speckled olive, brown or black, is common in Central, Southern and



GLASS SNAKE

Its average length is 27 inches; greatest diameter of body, ¾ inch; width of head, ⅝ inch; length of head, 1⅛ inch.

parts of the Eastern United States, in Great Britain, Europe, Western Asia and Northern Africa. It is a shy animal and lives chiefly on earthworms, slugs and larvae (young) of insects. Like the lizard, it can easily shed its tail, which, when the animal is frightened, stiffens and may be snapped off by a slight blow; hence the name *glass* "snake."

Blindworm, a smaller brown or silvery-gray reptile similar to the glass "snake," so named because the eyes are small and covered with a transparent skin. It is common in Southern California.

GLAUBER'S, SALT, *glau'berz,* a substance named after the German chemist, Johann Rudolf Glauber (1604-1668), who first prepared it

and who ascribed to it many curative qualities. This substance is sodium sulphate after it has absorbed a great quantity of water, its chemical composition being one molecule of sodium sulphate and ten molecules of water. Glauber's salt appears in the form of large, transparent prism crystals. It has a bitter, saline, but not acrid, taste. When it is exposed to air it loses its water and becomes a white powder. Glauber's salt is always found in small quantities in the blood. It occurs in great quantities in many mineral waters, in sea water, and also as the mineral *thenardite,* or *mirabilite,* which is found in the United States, Spain and Russia. Glauber's salt has been used in medicine since the seventeenth century as a purgative. It is also used in the manufacture of glass and in the dyeing industry.

GLAZING. See POTTERY.

GLENS FALLS, N. Y., a city of historical interest and commercial importance, situated in Warren County and on the Hudson River about midway between the northern and southern borders of the state. Albany is sixty-one miles south by rail, and Saratoga Springs is reached by a twenty-mile ride by trolley. The city is also situated on the Champlain Feeder Canal, and is about nine miles south of Lake George. Transportation is provided by the Delaware & Hudson Railroad, constructed to the city in 1869, and by the Hudson Valley Trolley System. In 1910 the population was 15,298; it had increased to 16,894 in 1916, according to Federal estimate.

Manufacturing facilities at Glens Falls are increased by abundant water power provided by the great Spier Falls Dam across the Hudson River, twelve miles north. Most prominent of the varied factories of the city are paper mills, in which over 800 men are employed. Ten shirt, collar and waist factories have 2,000 people on their pay rolls, and a cement company has an annual output of 600,000 barrels. In the vicinity are extensive black marble and limestone quarries. The city has Glens Falls Academy, Saint Mary's Academy, a business school and a library. An $80,000 Federal building erected in 1915, a $400,000 insurance building, a $150,000 bank building and a $150,000 hospital are the most noteworthy buildings.

Glens Falls was settled in 1763 and incorporated as a village in 1837. It was almost totally destroyed by fire in 1864, the loss amounting to $300,000. A similar disaster occurred in 1884. In 1908 the place was incorporated as a city. It is located on the Great War Trail leading from Lake George to Albany, and throughout the French and Indian and the Revolutionary wars a fortified post was located on the outskirts of the city. Burgoyne's forces also encamped here while on their way to Saratoga. The falls and rapids of the Hudson River at this point give the name to the city. These falls, with the cave which lies under the limestone formation here, were made famous through Cooper's *The Last of the Mohicans.* W.K.S.

GLOBE, as ordinarily understood, is a body shaped like a ball. As applied to the study of geography, a globe is a hollow sphere made of metal, plaster or pasteboard, on whose surface is shown a map of the world. It is called the *terrestrial globe,* and its purpose is to indicate the great land and water divisions, present an idea of the earth's geography as a whole, and simplify the study of the seasons and the succession of day and night by actual illustration of the manner in which the earth rotates on its axis. A similar device for studying practical astronomy, called the *celestial globe,* presents a map of the heavens.

The making of an ordinary schoolroom globe is an interesting process. Layers of paper are pasted over a spherical mold to the thickness of cardboard. The resulting shell is cut into two hemispheres, the dividing line marking the equator. The halves are then glued together around a wire representing the earth's axis, at right angles to the equator, its two ends representing the north and south poles. After the globe is covered with a variety of plaster and is made perfectly smooth and round, the map is pasted on. The flat map, such as appears in books, will not do, for the latter are plane surfaces, whereas the sphere has a curved surface. A map must therefore be specially made and printed in sections, with proper allowance for curvature. Small circles are printed for the polar regions, and a number of long strips, or gores, form the rest of the earth. As in all maps, the parallels of latitude and the meridians showing longitude are marked on the globe. See MAP.

In mounting the terrestrial globe on its stand, the axis is slightly inclined, to correspond with the inclination of the earth's axis. A movable vertical band of brass represents the *meridian,* and is divided into degrees and minutes; a stationary horizontal band of wood represents the earth's *horizon* and is marked

with several circles showing the thirty-two points of the compass, the twelve signs of the zodiac and the days and months of the year.

GLOBE, Ariz., a copper-mining and smelting town and cattle market of Gila County, situated in the southeastern part of the state. It is 575 miles east and south of Los Angeles, Cal., eighty-two miles directly north of Tucson, and on the Arizona Eastern Railroad. The number of inhabitants, in which are included Americans and Mexicans, was 7,083 in 1910. Globe is situated in a mountainous region. Copper mining and cattle raising are the principal industries, and gold and silver mining are also carried on. About 2,500 men are employed by one copper company. Nearly thirty miles northwest of the town is the great Roosevelt Dam, the construction of which cost more than $8,000,000. In the vicinity may be seen the Apache Trail and ruins of the Cliff Dwellers (which see).

The city contains the Old Dominion Library, a high school, Gila Valley Bank, Elks' Building, two hospitals, Kinney Park and a Federal building costing $30,000. Globe received a city charter in 1910. L.M.B.

GLOUCESTER, *glahs'ter,* one of the oldest cities of England, the capital of Gloucestershire. It is beautifully situated on the left bank of the River Severn, thirty-three miles northeast of Bristol, and about seventy-five miles northwest of London, in a valley sheltered by the Cotswold and the Malvern Hills. It is an important port and industrial center, with manufactures of engines, railway cars, agricultural implements, cutlery, large shipbuilding yards, foundries and flour mills. All public utilities are municipally owned and the town is progressive and enterprising. A canal admits vessels from the estuary of the Severn to spacious docks, and extensive commerce is carried on with foreign ports, especially those of the Baltic Sea. Population, in 1911, 50,035.

In the days of the "Venerable Bede" Gloucester was "one of the noblest cities of the land." The Norman kings, beginning with William the Conqueror, favored it as a place of royal residence. The most important building is the great cathedral, whose construction was begun in the eleventh century. In it Henry III was crowned. Population in 1911, 50,035.

GLOUCESTER, Mass., the principal fishing port in the United States and one of the largest in the world, is situated on the south side of Cape Ann, on Gloucester Harbor, an arm of Massachusetts Bay. Cape Ann is a rocky and barren headland whose coasts have witnessed many marine disasters. Norman's Woe, made famous by Longfellow's poem, *The Wreck of the Hesperus,* is a reef just outside the harbor. The city has an area of about twenty-three square miles and includes the villages of Annisquam, Bay View, East Gloucester, Freshwater Cave, Lanesville, Magnolia, Riverdale and West Gloucester. It is served by the Boston & Maine Railroad and several electric lines, and has steamer service to Boston, about thirty miles southwest. The population, which in 1910 was 24,398, was 24,478 in 1915, according to the state census.

The city offers its many summer visitors an excellent climate and fine beaches, while the quaint villages and the rocky coast are especially attractive to artists. There are a number of parks, a Federal building, city hall, Y. M. C. A. building, state armory, Magnolia and Sawyer libraries, the Gilbert Hospital, Home for Aged Fishermen and the Huntress Home.

Gloucester has a wide, deep harbor, and is the port of 300 fishing vessels; 6,000 men are engaged in the cod, halibut, herring and mackerel fisheries.

The first settlement, which lasted from 1623 to 1625, was made by fishermen from Dorchester, England. At the end of that time some of the settlers returned to England and some went to Naumkeag, now Salem. A permanent settlement was made about 1633, the township was incorporated in 1642, and Gloucester became a city in 1873. In 1908 the commission form of government was adopted.

GLOUCESTER CITY, N. J., a city of Camden County, where battleships and the largest of merchant steamers are constructed. It is on the Delaware River, and by rail is four miles south of Camden and eight miles south of Philadelphia. With the latter city it has connection by ferry; it is served by the Atlantic City and the Pennsylvania railroads. The population, which in 1910 was 9,462, was reported by a Federal census of 1916 to be 11,109. There is a small per cent of Irish and German inhabitants.

At Gloucester City are a United States immigration station, a detention house, administration building and other buildings connected with the port of Philadelphia. The city contains Buena Vista Park and Gloucester Beach. More than 5,000 men are employed in the great shipyards. Gloucester City was incorporated in 1868. A.D.K.

GLOVE, *gluv,* a covering for the hand used by mankind since the days of ancient Cave Dwellers. The word is derived from the Anglo-Saxon *glof,* or *loof,* meaning the *palm of the hand.* Gloves are made of leather, the skins of sheep, calves, lambs, kids, dogs, rats, kangaroos, and also of silk, cotton, canvas and worsted. All kinds of leather or kid for glove-making are treated differently from leathers for other purposes; the object sought in dressing and tanning the skin is to make it soft and pliable. The leather is usually cut by dies and sewn by machinery. Silk, cotton and worsted gloves are sometimes knitted, but more often are cut from pieces of woven fabric and sewn together. In the manufacture of men's gloves the United States leads the world, but France is supreme in the production of the finer kinds of women's gloves. The name *kid,* commonly applied to gloves of soft, thin leather, does not imply that such gloves are made of kid skin. The number of kid-gloves produced annually is far in excess of the supply of any one kind of leather. The term *dog-skin* is also applied to gloves made of sheep-skin, and relates only to the finish of the leather. Suede gloves are made with the inside of the skin forming the outside of the glove.

The state of New York is the center of the American glove industry. Glovemakers from Scotland were induced to settle on lands in Fulton County granted to them by Sir William Johnson in 1760. From that date glove-making has been the principal occupation of the inhabitants of that section. One city, Gloversville, so called on account of the number of its glove-making establishments, annually produces gloves to the value of $9,000,000, the output of the entire county being valued at over $14,000,000. In Canada the yearly production is valued at about $3,000,000, divided between Ontario and Quebec. The glove-making industry has been little developed in Western Canada.

Among the Greeks gloves were worn as a protection to the hands when doing rough work. The Romans used them as ornaments and as a sign of rank. In the days of chivalry knights often wore ladies' gloves fastened to their helmets as signs of favor. Gloves were also regarded as battle gages, to be thrown down by a challenger and picked up by one accepting the invitation to fight. To shake hands while wearing a glove, and not to extend the bare hand of fellowship, was in the days of knighthood regarded as an insult or challenge, as signifying a desire to meet in combat. At the present day it is not regarded as correct form to offer a gloved hand to be shaken; when such an act is necessary an apology should be offered.

Consult Redmond's *The Leather Glove Industry;* Beck's *Gloves: Their Annals and Associations.*

GLOVER, JOHN (1732-1797), an American Revolutionary soldier, one of the most prominent men of his day, but now regrettably forgotten. He was a cobbler in Massachusetts in 1775, but rose to the rank of brigadier-general. Glover was in charge of the retreat from Long Island, was a brigade commander at White Plains, had charge of the boats by which Washington crossed the Delaware, was responsible for British prisoners on their march from Saratoga to Cambridge, was a member of the court which tried Major Andre and was officer of the day when Andre was executed.

GLOVER, RICHARD (1712-1785), an English poet, practically self-taught, who was one of the leading men of his day. He never attended a University, but acquired a good knowledge of Greek, and Grecian themes predominated in his literary work. His greatest work was *Leonidas,* an epic poem in blank verse.

GLOVERSVILLE, *gluv'erz vil,* N. Y., a city in Fulton County, in the east-central part of the state, fifty miles northwest of Albany and fifty miles east of Syracuse. It is on the Fonda, Johnstown & Gloversville Railroad and has an electric interurban line to Schenectady. In 1910 the population was 20,690; in 1916 it was 22,082, by Federal estimate. The area is four square miles.

Gloversville leads all other United States cities in the manufacture of gloves, and together with Johnstown, a short distance south, controls a large per cent of the entire production of gloves in America. In addition to glove and mitten-making, the city has large leather-dressing plants, and manufactories of pocket-books and leather novelties. Much of the work is let out to home workers. The city is situated at the foot of the Adirondack Mountains. It has a Federal building, erected at a cost of $100,000; a state armory, Y. M. C. A. building, Old Ladies' Home, Carnegie Library and the Nathan Littauer Hospital. A tubercular hospital, maintained by the county, is three miles north of the city.

Gloversville was settled about the time of the War of Independence, and was known as

Stump City until 1823. It was incorporated as a village in 1851; as a city in 1890. L.S.R.

GLOWWORM, another name for the firefly (which see).

GLOXINIA, *glok sin'i a,* a popular greenhouse plant, remarkable for its richly-colored, velvety leaves and large, graceful, delicately-tinted flowers. Although a native of tropical America, the gloxinia is now cultivated in

GLOXINIA

houses and gardens throughout America. It is a delicate plant requiring a light soil and careful watering, but the beauty of its lovely bell-shaped flowers and soft leaves will repay any amount of thought and effort.

GLUCK, *glook,* Alma (1886-), one of the world's greatest prima donnas, whose voice has been pronounced of the same exquisite soprano type as Melba's. Although born in Bucharest, Rumania, Mme. Gluck is essentially American, for her parents brought her to the United States when she was six years old. Most of her musical education was obtained in America, and she is noteworthy as being a grand opera singer of first rank who was not trained in Europe. In private life she is Mrs. Efrem Zimbalist, wife of a Russian violinist who has achieved fame. She attained immediate success upon her first appearance in New York City, with the Metropolitan Opera Company, as Sophie in *Werther.* Later she repeated her American triumphs when she made her debut in London. In addition to many appearances in concert, she has sung leading rôles in *Boheme, Orfeo, Bartered Bride, Faust* and other operas. In 1917 she was prevented by war from filling American engagements.

GLUCK, Christoph Willibald (1714-1787), a musical composer who stands with Wagner as a reformer of opera. In the dedication of one of his finest operas he wrote: "Music should in opera occupy towards poetry the same relation as is held by a color scheme and *chiaroscuro* towards a fine drawing; that is to say, to add life to its figures without injuring their outline." This ideal he always strove to attain.

He had little musical education in his home town in Bavaria. In 1740 he composed *Artaserse,* his first opera, for the court theater of Milan, which was well received, despite the innovations of style which he introduced. However, the appearance later in Vienna of his operas *Orfeo ed Euridice, Alceste* and *Paride ed Elena* marked the birth of the so-called music-drama; they carried into practice his theory of opera as a national and coherent form of art. The crucial point of his career was at the production of *Iphigénie en Aulide,* in Paris in 1774, at the same time with one of the same libretto by Piccinni, the Italian composer and master of the "old" school of opera. All Paris took sides, but the victory was with Gluck.

In his greatest opera, *Iphigénie en Tauride,* he included all that was best in his five other great works. He composed fifty-four dramatic works in all. From Handel's music he drew inspiration, which he gratefully acknowledged to the end of his days. Gluck's temperament was a combination of vanity and impetuosity, coupled with a sincere love for his art and a generous appreciation of the good work of his fellow composers.

GLUCOSE, *gloo'kose,* a sugary syrup obtained from corn, about half as sweet as cane sugar. It is made by treating the starch with sulphuric or hydrochloric acid, greatly diluted. The syrup is called glucose and the more solid product, grape sugar. There are eighteen processes required in the manufacture of glucose, the whole taking about eighty hours. The corn is first steeped, then ground in water, and the starch, after settling, is washed and cleaned with hydrochloric acid in closed vessels called converters. The action of the acid is then neutralized by chalk or other alkali, and a long process of filtration follows. The liquid becomes thick and syrupy after the final treatment, and grape sugar results if the converting process is carried still further. Glucose is now put to many uses. Because it does not crystallize it is used in the preserving

industry extensively. It is also used freely in the making of candy and for mixing with cane-sugar molasses for table uses. It is likewise used as a substitute for malt in brewing.

Since 1890 the manufacture of glucose has become a great industry in the United States and to some extent in Canada, and the process has so greatly improved that forty pounds of glucose are now made from one bushel of corn, while formerly only twenty-six to thirty pounds were obtained. See CORN.

GLUE, *gloo,* an impure gelatin, best known as the substance which holds pieces of wood, such as furniture, together. It is also an adhesive for other materials than wood, principally leather and paper, and as sizing it gives glaze to fabrics and paper. The finest in the world, which comes from France, is used by straw-hat makers. The name is sometimes applied to adhesives which do not contain gelatin, especially marine glue.

Glue is derived from the hides, hoofs, horns, bones and sinews of animals. The very best American glue is from sinews. In England bone-glue making is still important, but in America the more difficult manufacture of hide glue has largely taken its place. After a chemical process which includes boiling, a jelly is obtained, which, with further refinement and drying in rooms of carefully regulated temperature, becomes the brittle glue of commerce. This, when dissolved in hot water, gives a cement that will withstand several hundred pounds of strain. Glue heated too long, or more than once, is weakened. Marine glue is useful principally to shipbuilders. It is usually composed of India rubber, naphtha and powdered shellac.

Glue Industry. The glue industry in America began with Peter Cooper in 1827. The annual product is worth about $15,000,000, though there are fewer establishments than in 1880, when $4,000,000 was the average annual value. The tendency is for the manufacture to center near the large stockyards of the Middle West, and the larger packing firms have their own factories.

GLUTEN, *gloo'ten,* a tough, sticky, somewhat elastic and almost tasteless substance of a grayish-yellow color, found in wheat and other cereal grains. It is a vegetable albumin (see ALBUMEN), and its presence in cereals is important because it is almost the only substance in these foods that contains nitrogen. Gluten may be obtained from the flour of wheat by filling a muslin bag with flour and kneading it under running water. In this operation the starch of the flour will be washed away in a milky stream, the gluten remaining in the bag as a sticky mass.

It is the gluten in flour that makes bread dough stick together, and this stickiness is utilized in the making of flour paste. Gluten bread and biscuits are prescribed for those suffering from diabetes (which see). Wheat which contains a high percentage of gluten is used in the manufacture of macaroni (which see). On an average there are eight pounds of gluten in one hundred pounds of wheat flour. See FOOD, subhead *Chemistry of Food.*

GLUTTON, *glut''n,* the English name for the European carnivorous, or flesh-eating, animal which is known in the United States as the *wolverine.* It belongs to the weasel family, but is entirely different in appearance,

GLUTTON, OR WOLVERINE

being heavily built and about two and one-half feet in length. The glutton is said to be the most powerful animal for its size in existence, and it is noted for its enormous appetite. It devours large numbers of young foxes and is also an enemy to beavers. The fur is dark brown or almost black, sometimes having white markings, and is of some commercial value.

GLYCERINE, also spelled **GLYCERIN,** *glis'ur in,* a colorless, odorless, syrupy liquid of sweetish taste, employed extensively in the arts and in medicine. Glycerine is a by-product of the candle and soap industries. Its ultimate source is the fats and fatty oils found in plants and animals, such as cottonseed oil, lard and tallow. In the manufacture of stearin for candles, fats are treated with steam at a high temperature, and usually in the presence of a relatively-small quantity of some substance which will accelerate the action of steam upon the fat. (Lime and sulphuric acid are among these accelerating agents.) In soap-making, fats are boiled with alkalies. In the former industry one pound of glycerine is pro-

duced for every nine pounds of stearin; in the latter, one pound of glycerine for about eleven pounds of dry soap. The glycerine is purified by distillation in superheated steam. About 100,000 tons is the world's annual production.

Chemists prefer to call pure glycerine *glycerol;* good commercial glycerine is over ninety-nine per cent pure glycerol. At a low temperature glycerol sometimes solidifies into crystals, melting at 63° F., but this is rare, and just what is necessary to start the crystallization is not known. Ordinarily even the purest glycerine remains liquid, however cold it is kept. The boiling point, 552°, is very high for an organic compound. It is very hard to set glycerine on fire. It burns with a colorless flame without charring, and, if pure, leaves no ash. At the ordinary temperature glycerine does not evaporate. On the other hand, it absorbs moisture from the air; it will take up half its own weight of water in this way. These properties make it a very useful substance to add to materials to prevent their drying out. Among the commodities to which it is added for this purpose are tobacco, copra (shredded cocoanut), confectionery, heavily-starched cotton goods, and inks for rubber stamps. The tobacco industry of the United States consumes about 2,500 tons of glycerine a year.

Glycerine mixes with water and alcohol in all proportions and dissolves many inorganic and organic substances. Some dyes are dissolved in glycerine and then mixed with water. Stains made on linen by coffee and tea can be removed by moistening the material with glycerine, allowing it to stand for a time and then steaming or washing with soapy hot water. Glycerine added to water lowers its freezing point. For this reason it is sometimes used in gas meters, floating compasses and automobile radiators. Mixed with lead oxide it makes a good cement.

Glycerine feels oily and warm. The warmth is due to the mixing of the glycerine with water, which it extracts from the skin. It is used in medicine to allay inflammation, thus having a soothing effect. The same *emollient* property makes it useful as a cosmetic for chapped hands and sore lips. Taken internally in very small doses it is harmless. Larger doses have a purgative action and very large doses may even prove fatal. It is sometimes used as a solvent for other medicines. As a preservative, glycerine is sometimes applied to untanned hides and to meat.

The greatest industrial use of glycerine is for the manufacture of the powerful explosive, *nitroglycerine* (which see). See, also, ALCOHOL; EXPLOSIVES; FAT; SOAP.

GLYN, *glin,* ELINOR, an English novelist whose works have been widely read and much discussed because of their sensational character. Her early novels, of which the most noteworthy were *The Visits of Elizabeth* and *The Reflections of Ambrosine,* attracted no special attention, but *Three Weeks,* which appeared in 1907, was one of the most talked-of books of the decade. Later publications include *Elizabeth Visits America, The Reason Why* and *His Hour.* Most of Mrs. Glyn's works are unwholesome in tone, for they treat of sex questions in a morbid, unpleasant manner.

Mrs. Glyn is by birth a Canadian, the daughter of Douglas Sutherland of Toronto. Clayton Glyn, to whom she was married in 1892, is an Englishman, but they have always preferred to live in France.

GLYPTODON, *glip'toh don,* a gigantic extinct mammal, which was probably ten or twelve feet in length. Its fossil remains have been found in South America, and occasionally in the United States. It had a solid armor of

SKELETON OF THE GLYPTODON

jointed plates, arranged in transverse rows, and the head and tail were covered with similar plates. The character of its claws shows that the animal could not have burrowed, like the armadillo, although it is believed to have belonged to the same family.

GNAT, *nat,* a name given various "blood-thirsty," irritating insects, the most common being the mosquito. All gnats are two-winged; each is equipped with a long, sharp, sucking and piercing organ called a *proboscis* (which means *snout* or *trunk*). Most gnats lay their eggs on water, where they float three days and then hatch. If standing pools of water were removed, these irritating insects would be less numerous. The buffalo gnat is very annoying to domestic animals. In the northern woods an almost invisible gnat called the *punky* is a most troublesome pest; it is so tiny

the Indians have called it the "no-see-um." See Mosquito; Hessian Fly.

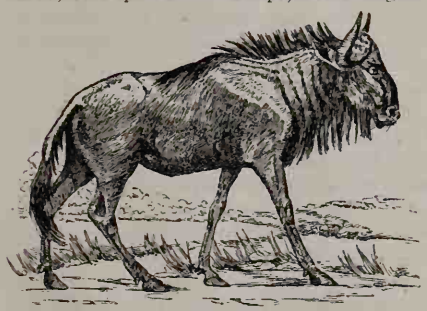
GNEISS, *nise.* Gneiss is granite, with the minerals comprising it—quartz, feldspar and mica—arranged in layers (see Granite). The layers may be straight or curved, and they may be very thick. The layers of mica are easily separated from the others. Much of this rock is rich in ores, and large quantities of gold, silver, copper, iron, antimony and cobalt are obtained from it. Like granite, it contains no fossils. Large crystals of feldspar are found in some varieties, which are known as *porphyritic* gneiss.

The only difference between gneiss and granite is in structure. The minerals forming granite are distributed without apparent order; in gneiss they are arranged in layers. Gneiss is found in large quantities in all mountain systems.

GNOMES, *nohmz.* In Norse mythology fairy dwarfs, called gnomes, guarded the mines and miners. The male gnomes, who were ugly and misshapen, were condemned to live underground all their lives, for if they appeared in daylight they were turned to stone. Under the leadership of Sindri they mined silver, gold and precious stones, besides serving as smiths for the gods. The women, who were very good and beautiful, were only a foot high, and were the special guardians of diamonds; occasionally some of them would creep out to torment man, if he had been wicked. Pope refers to the fabled gnomes in his *Rape of the Lock,* as in the following quotation:

> Swift on his sooty pinions flits the gnome
> And in a vapour reached the dismal dome.

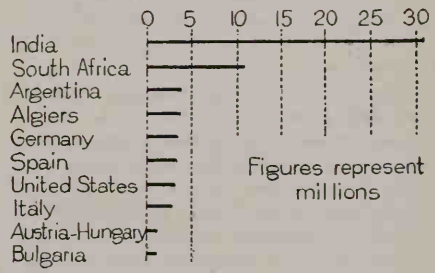
GNU, *nu* (from the Hottentot *gnu,* or *wildebeest*), is a species of antelope, resembling in



THE GNU

form the horse, the buffalo and the antelope. Both sexes have horns. There are two species —the common, or white-tailed variety, now practically extinct, and the brindled gnu, still to be found in the interior of Africa. They travel in herds of thirty or forty, and apparently are friendly with zebras and quaggas. In common with the buffalo and the bull, gnus are angered by the sight of scarlet. Their flesh is said to be palatable and nourishing.

GOAT, humorously called "the poor man's cow," is a member of the sheep family. It is a hardy animal and furnishes sweet, nourishing, health-giving milk, edible flesh and a very useful hide. It lives on food which other ani-



THE GOATS OF THE WORLD

mals will not touch. Though not quite the size of sheep, goats are stronger and less timid, and they move more quickly. They differ from sheep in that their hollow horns are erect and turned backward, their tails are shorter, and the male is generally bearded under the chin and has a peculiar odor. The male goat is sometimes called *billy goat;* the female, *nanny goat.* Wild goats live in mountains and rocky places. Domestic goats, thought to have originated from the wild Persian species, are found all over the world, great herds being kept in many parts of Europe, Asia and Africa. They are often trained to be pets and are harnessed to carts and driven by children. In many places they are used as beasts of burden.

Although not highly esteemed in America and frequently the object of levity, the goat is a most valuable economic creature, for reasons given in the opening sentences of this article. Goat's milk nourishes more people, probably, than does cow's milk, throughout the world; those who become accustomed to the former will not of choice use the latter. For this reason, when natives of North Africa responded to France's call for soldiers in 1914 in the War of the Nations, it was necessary to maintain herds of goats near the fighting lines to furnish milk for them.

The *Angora goat* is a valuable spiral-horned, silky-haired species of goat. Only a few of these animals are found in Canada, but there are thousands in the United States. The soft, silvery-white hair, which hangs down in curly locks eight or nine inches long, is called *mohair,* and is used in various manufactures. (See MOHAIR.) The pelts are made into rugs, robes, muffs, capes, etc. Angora skins are worth from thirty-five cents to $3.50. The flesh is delicate and nutritious. These goats are wonderful grazers, clearing away weeds and brushwood. These and other species of goats furnish milk richer than cow's milk, and the inner hide is used for shoes, gloves, music rolls, book bindings, etc.

Goat Industry. Though the value of goats is recognized the industry in the United States has not yet grown large; particularly is there a shortage in goatskin for manufacturing purposes. In 1910 there were 2,798,160 goats of various kinds in the United States, valued at $5,964,812, Kansas City being the leading goat market. Still over $30,000,000 worth of goatskins are being imported into the United States each year from the British Indies, Southern Russia, South America and Mexico. The finest goatskins in the world are imported from the region of the Black and Caspian seas. Efforts are being made to encourage the goat industry in the United States, and to make it a paying one. See CASHMERE GOAT; ROCKY MOUNTAIN WHITE GOAT. M.S.

Consult Robertson's *The Case for the Goat.*

GOAT'SUCKER, a common name for a family of moth-catching, owl-like birds, the *nightjars.* The first name was given from an incorrect ancient belief that these birds milk goats. The idea probably arose because they

GOATSUCKER, OR NIGHTJAR

look for insects at twilight, searching near the ground and in pastures where domestic animals graze. The more appropriate name, nightjar, was derived from their night-flying habits and jarring cries.

Nightjars vary in size from eight to fifteen inches, and the soft plumage is in all shades of gray and brown, mottled with white. Members of this family are found almost everywhere. Representatives in America are the nighthawks and whip-poor-wills (which see). Other general characteristics of the goatsucker family are the short, thick head with large, gaping mouth and very small bill with bristles at the base. They catch their food while flying on wings which, considering the size of the bird, are long and powerful. They sleep throughout the brightest hours of the day, resting lengthwise on their perch or on their nest on the ground.

GOBI, *go'be,* DESERT OF, a treeless, dreary plateau rising 3,000 feet above sea level, in the central part of Mongolia, in Northern China. It has only a few permanent settlements, all located in the northern part of its territory. Over its sandy waste, which covers nearly 300,000 square miles, an area twice as large as Montana, are scattered many rocky table-lands and mountains, but in the summer a scanty rainfall makes enough pasturage for the flocks and herds of the wandering tribes. During the rest of the year the climate is very severe, especially along the borders. A number of caravan routes lead across this region from China proper to Siberia, and these are used largely by nomadic tribes. Several explorers, especially Przhevalski and Sven Hedin, have obtained much valuable information during the past fifty years concerning the Gobi. See DESERT; NOMAD LIFE; for location on map, see ASIA.

GOD, a name given, in its broadest sense, to any superhuman being who directs the activities of various races of the world. As used by Christian peoples, the term applies to only one Being, and the plural form *gods* is an impossibility. This article will consider both uses of the term.

The Heathen Gods. Every people, however barbarous, however little removed, apparently, from the brutes, seems to have some sort of an inborn idea of a being more powerful than man. Strangely enough—or so it seems to those acquainted with the Christian idea of God—this more powerful being is not necessarily *better* than man. The Greeks were a beauty-loving, virtue-loving people, and the myths they wove about their gods were in many instances exquisite, but fully as often these myths showed the gods to be cruel, vengeful or immoral (see MYTHOLOGY). Such tales

do not seem to have shaken the faith or allegiance of the worshipers. What wonder, then, since the Greeks, on their high plane of civilization, could invent for themselves such faulty deities, that the savage tribes often set up as objects of their worship beings which seem like devils rather than like gods? Some of these have not one redeeming virtue, but they are strong and very jealous, and the poor, frightened savages dare not falter in their worship for fear of dire punishment.

The Hebrew Idea of God. Most of the ancient peoples, like many of the moderns whom Christianity has not touched, believed in large numbers of gods. One had the sun as his especial charge; one the moon; one presided over birth and another over death. Each tribe, too, had its own gods, and when one tribe conquered another it was looked upon as proof that the gods of the conquerors were stronger than those of the vanquished. In the early history of the Hebrews they, too, looked upon their God as just a tribal deity who had no concern with the welfare of any people but the Hebrews, and who cared more for formal rites of worship than for any moral purity. Gradually the conception broadened, until God became the strong moral force in the national life and was looked upon as controlling other nations as well as Israel. It was still believed, however, that He governed the world only for Israel's good, and it was not until after the beginning of the Christian Era that a few enlightened men began to spread the idea that God was no respecter of nations, but was a loving father, caring for all peoples alike.

The Christian Idea. This universal character of God is one of the central ideas in the Christian conception. That He is a personality and not a mere force; that He is eternal, all-wise, all-powerful and all-loving; and that men may have a spiritual communication with Him—these are the chief qualities of the God of the Christians.

The discussion so far has touched merely upon various *conceptions* of God, but has said nothing as to His actual *existence*. Learned men from the beginning of the Christian Era have busied themselves over the question of the existence of God, and have brought forth various so-called proofs; but after all it is a matter incapable of the sort of proofs which material facts admit of. Theologians argue that it is evident in every phase of life that back of the universe there is a supreme *plan*, which must have been formed by a rational Being; that man himself, with his moral nature, implies a moral personality above him; and that it is incredible that this very highest conception of which man is capable—the conception which has led him to his greatest efforts and his finest achievements—should be but a figment of his own imagination. They also point out as proof of the existence of God the fact of design in nature; that is, the adaptation of all forms of life to their environment. Finally, the Christian holds fast to the revelation of God as given by Christ in the New Testament—a revelation which admits of no doubt.

These, briefly stated, are the chief arguments for the existence of God, but to them the atheist objects that they are not tangible proofs. And indeed, in the last instance, every man can but fall back on his own inner conviction, and on the generally admitted truth that a God who could be completely comprehended by a finite mind would really not be a God at all. A.MC C.

Related Subjects. The reader is referred to the following articles in these volumes:

Agnostic	Bible
Atheism	Jesus Christ

GODERICH, *god'ritch,* the county town of Huron County, Ontario, in the southwest part of the province and on Lake Huron, at the mouth of the Maitland River. Toronto, 134 miles to the southeast, and Guelph, eighty miles southeast, are connected with Goderich by branches of the Grand Trunk and the Canadian Pacific railways, and other branches of the Grand Trunk provide connection with London and Port Huron. Steamships running from Detroit and other lake ports make Goderich a port of call. The delightful climate of the vicinity has made Goderich best known, perhaps, as a summer resort, but it is also an important distributing and manufacturing center. Refined salt, leather, flour, dried apples, knitting machines and road machines are noteworthy products, and limestone and clay are found in the neighborhood. Electrical power is supplied from Niagara Falls. Population in 1911, 4,522; in 1916, about 5,200.

GODFREY DE BOUILLON, *de boo yoN'* (about 1060-1100), duke of Lorraine, was one of the foremost leaders of the First Crusade. After the conquest of Jerusalem, a Christian kingdom was founded, of which Godfrey was unanimously elected sovereign. However, he refused the kingly title and assumed the hum-

bler one of Baron and Defender of the Holy Sepulcher. During the single year of his rule, he was successful in repelling the Egyptian attack at Ascalon, and with the assistance of

HIS TOMB
It is in Jerusalem, and dates from about the year 1150.

others of the pilgrims he drew up from the various feudal statutes of Europe the elaborate medieval code of laws known as the *Assizes of Jerusalem*.

During one of his expeditions into the territory of the Moslems, he was visited by several emirs who expressed surprise at seeing their conqueror without a guard, in a common tent which boasted only of a small, rough bed such as was allotted to the humblest soldier in his train. Such was his simple mode of life. The minstrels sang of his valor, and the fairest ladies of his land wrought with loving fingers the devices upon his banner. He died at the age of forty, but in his short life won a name as one of the foremost representatives of the chivalry of his age.

GODI'VA, Lady. According to legend, Earl Leofric, lord of Coventry, was a stern and harsh feudal baron, who taxed the citizens of the town to the utmost. Lady Godiva, his wife, seeking to help the people, begged her husband to ease their burdens. "Ride naked through the town," said the Earl, "and I will grant your request." Lady Godiva issued a proclamation requesting everyone in the city to remain within doors on a certain day, and not even to look from their houses. Clothed only in her long hair, she mounted a white horse and rode through the streets. Legend further states that the only one who tried to see her was a tailor, who peeped through a hole in a shutter, and was immediately struck blind. This is the origin of the "Peeping Tom" tradition. Earl Leofric was true to his promise and gave great concessions to the townspeople. For centuries a fair was held at intervals to celebrate Godiva's heroism.

GOD SAVE THE KING, the national song of Great Britain. It dates from 1743, the year of the victory of George II over the French army at Dettingen, and is a prayer for the glory and happiness of the sovereign. The origin of the melody is obscure. It is variously attributed to John Bull, Lulli and Handel, although Henry Carey (a musician and poet born in London about 1696) is generally accredited as the author both of the words and the music. The song has spread across to the Continent in more or less altered form; in fact, Germany and Switzerland each claim it. The music was formerly used by Russia for its national air, while in the United States one of the most popular of patriotic songs, *My Country 'Tis of Thee,* which has become in effect a national hymn, is sung to it. The first stanza of the English song follows:

God save our gracious King,
Long live our noble King,
God save the King!
Send him victorious,
Happy and glorious,
Long to reign over us,
God save the King!

GOETHALS, *go'thalz,* George Washington (1858-), an American civil and military engineer, under whose efficient administration one of the most important projects of modern times, the Panama Canal, was brought to completion (see Panama Canal). He was born in Brooklyn, N. Y., and was educated at the College of the City of New York and at the United States Military Academy at West Point. On his graduation from the latter institution in 1880 he was appointed second lieutenant in the corps of engineers, and rose steadily in rank until he reached the grade of major-general, in March, 1915. His promotion from the grade of colonel to that of major-general was a fitting recognition of his genius as director of the great Panama enterprise.

GEORGE W. GOETHALS
Resourceful engineer, organizer and leader of men, whose lasting glory is connected with the building of the Panama Canal. He is now a major-general in the United States army.

Goethals was an instructor in civil and military engineering at West Point from 1885 to 1887, and he had charge of the construction of the Muscle Shoals locks and dams on the Tennessee River, which was completed in 1889. During the Spanish-American War (1898) he was lieutenant-colonel and chief of engineers of United States Volunteers; later his ability and energy won him an appointment to the board of fortifications in connection with the coast and harbor defense service.

In 1907 President Roosevelt brought him into national prominence by appointing him chairman, as well as chief engineer, of a commission to complete the Panama Canal. His management of the great enterprise, with its many problems and difficulties, was a striking illustration of what may be accomplished by a man of forceful personality, initiative and executive ability. The work was thoroughly organized and was carried on harmoniously and systematically; and the important questions of sanitation, housing and food, and the social organization of the Canal Zone were handled no less admirably. In accomplishing the task of making the Panama Canal Zone healthful the credit belongs to Surgeon-General Gorgas (which see). Though the work was scheduled to be completed on June 1, 1915, a vessel passed through the canal on August 15, 1914.

In February, 1914, President Wilson appointed Goethals first civil governor of the Panama Canal Zone. This position he retained until 1916. In October of that year he was appointed chairman of a committee to investigate the operation of the Adamson Railroad Law, which had raised the wages of the highest paid employes over twenty per cent.

In April, 1917, after accepting an invitation to construct a highway system for New Jersey, he was recalled to the Federal service to build a vast merchant marine for the United States as part of the plan of war against Germany. Because of friction he resigned and was made acting chief quartermaster of the American army.

GOETHE, *gö'te,* JOHANN WOLFGANG VON (1749-1832), a German poet, novelist, dramatist and philosopher, not only the most eminent figure in German literature, but one of the greatest geniuses the world has produced. Like Socrates, the Athenian, Shakespeare, the Englishman, and Dante, the Italian, he was endowed with genius of the universal order, for he was responsive to all the feelings and experiences that are common to humanity. He was distinguished for scientific attainments, for literary and artistic criticism, as a writer of fiction and as a dramatist, yet he made his happiest contributions to his country's literature in the field of lyric poetry. From his pen also came one of the most splendid achievements of his age, *Faust,* the greatest drama of the German people. On this he labored from early manhood until nearly the end of his career.

GOETHE

Goethe's *Faust* is more than a poetic and dramatic treatment of the old legend—the story of a weary scholar who sells himself to the Devil that he may taste the joys of youth and love (see FAUST). In it the reader will find a summary of the poet's own experience, and the expression of his philosophy of life. In the second part the drama becomes an allegory of human character and experience: it pictures a Faust who finds salvation in useful labor and who finally triumphs gloriously over the powers of darkness. This was the poet's "confession" of what life had taught him.

Goethe was born at Frankfort-on-the-Main on August 28, 1749. His early education was directed by his father and by private tutors, and at the age of sixteen he was sent to Leipzig to study law; there he varied the routine of school work by writing lyrics and studying art. After an illness which compelled him to return to Frankfort, he resumed his law studies at the University of Strassburg, and in 1771 received his degree. During his sojourn in Strassburg he formed a momentous friendship with the poet Johann Herder, who opened up to him the beauties of Shakespeare's writings, and taught him to love the old folk songs. Goethe's poems written at this time mark the beginning of a new era in German lyric poetry.

Between 1771 and 1775, a period in which he occupied himself as a lawyer at Frankfort and at Wetzlar, he wrote his first important drama, *Götz von Berlichingen,* and a novel, *The Sorrows of Werther,* the latter of which has immortalized one of his unhappy love affairs. In 1775 he was invited by Charles Augustus, the young Prince of Weimar, to become a member of his court at the capital of Saxony, and for

the next ten years he was deeply occupied with affairs of state, devoting himself to agriculture, horticulture, geology and mineralogy, and proving himself an able and conscientious minister whose grasp of practical affairs was astonishing. It was through this work that he came to love the study of natural science, to which he gave much attention during the last years of his life.

The years between 1786 and 1788 were spent in Italy. Coming there under the influence of classic art and literature, Goethe's own art became calmer and freer, and the unfinished dramas which he brought with him to Italy—*Iphigenie, Tasso, Egmont* and *Faust*—begun when he was under the spell of the Romantic movement (see ROMANTICISM), were completed in an entirely different spirit. Several unfruitful years followed his return to Weimar, where, in 1791, he was appointed director of the ducal theater. This post he held for twenty-six years. In 1794 there came a new influence into his life, the friendship of the poet Schiller. Stimulated by the latter's enthusiasm for literature, he completed in 1796 his most significant novel, *The Apprenticeship of Wilhelm Meister,* a story of theatrical life which contains one of his most charming lyrics, *Kennst du das Land?* The English translation of this beautiful song is familiar:

Know'st thou the land where the fair citron blows,
Where the bright orange midst the foliage glows,
Where soft winds greet us from azure skies,
Where silent myrtles, stately laurels rise,
Know'st thou it well?
'Tis there, 'tis there,
That I with thee, beloved one, would repair.

The next year Goethe published his epic of humble peasant life, *Hermann and Dorothea.* Several exquisite ballads followed, and in 1808, with the publication of the first part of *Faust,* he entered upon the final period of his literary career. These last years in Weimar saw the completion of a novel, *Elective Affinities;* his autobiography, *Truth and Fiction Relating to My Life;* a sequel to *Wilhelm Meister;* a collection of Oriental lyrics; and the second part of *Faust.* As he laid aside this monumental work, the year before his death, he said, "It is now really indifferent what I do, or if I do anything at all."

He died on March 22, 1832, and was buried in the ducal mausoleum, near the resting place of his friend and patron, Charles Augustus. The house in Weimar, which was his home for so many years, and the one in Frankfort where he was born, are preserved as memorials of him, and many of the important cities of Europe and the United States have erected statues in honor of this master-genius. See GERMAN LITERATURE. B.M.W.

GOITER, *goi'ter,* an enlargement of the thyroid gland, which is located nearly in the front of the neck. The disease may appear in the form of a small swelling, or it may produce a growth of large proportions, several inches deep. It is prevalent in many countries, but particularly in the mountainous regions of Switzerland and in Northern Italy, where lime formations abound. A general lack of nutrition, hardening of the tissues, and the habit of carrying heavy weights on the head, are some of the causes of goiter. One treatment of a certain form of the disease is the local and internal administration of small doses of iodine, but a physician should always determine whether this is the proper method to employ. The X-ray has also been successfully applied. Some authorities advise the entire removal of the goiter by operation, but this must be followed by the continued administration of thyroid lymph. The disease is seldom fatal.

GOLCONDA, *gol kon'da,* the ancient city of India which lay halfway between Madras and Bombay, famous in olden times for diamonds, which, however, were merely cut and polished there. The expression *richer than Golconda* became proverbial. The ruins of this city of the long ago are still famous for the ancient fortress, now used as a state prison, and for the gray-stone burial places of one-time rulers of the ancient kingdom of Golconda.

GOLD. So far as is known there has never been a time when this yellow metal has not been "the precious metal," more sought after than any other. All researches show that man knew of it before he knew of any other metal, and that it was everywhere, in a sense, the standard of value. The Assyrians and the Egyptians, the founders of the very oldest civilizations, expended their skill in fashioning ornaments from it; and what the ancient Hebrews thought of it is shown by the fact that it seemed the only thing with which they could compare those "precepts of the Lord" which were the greatest factor in their national life. "More to be desired are they than gold," chanted the psalmist; "yea, than much fine gold." Some of the Oriental peoples almost worshiped it, for was it not in its color and luster like the sun, the god of their idolatry?

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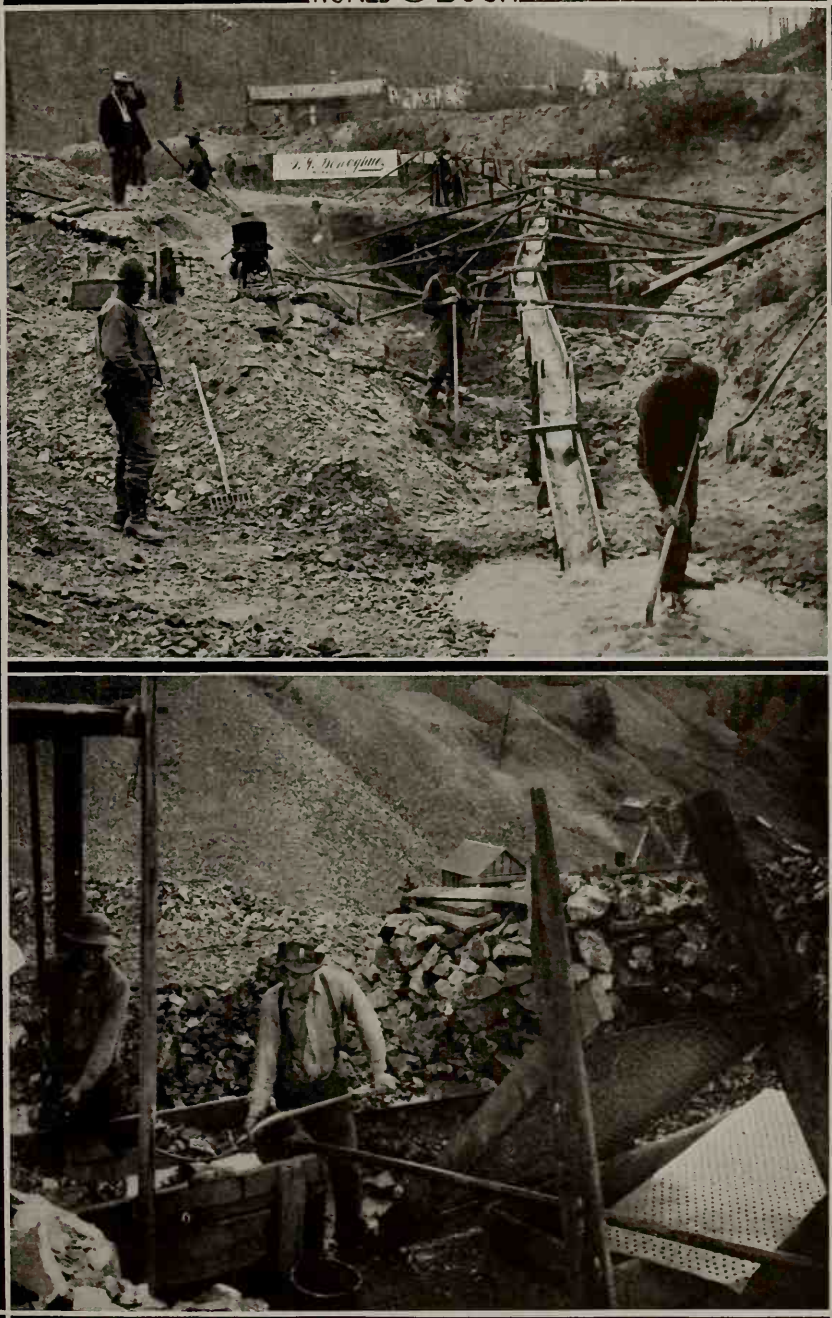

IN QUEST OF GOLD.

Above, miners at work in the Yukon district. Below, Bullhead mine, in the rich Colorado gold field.

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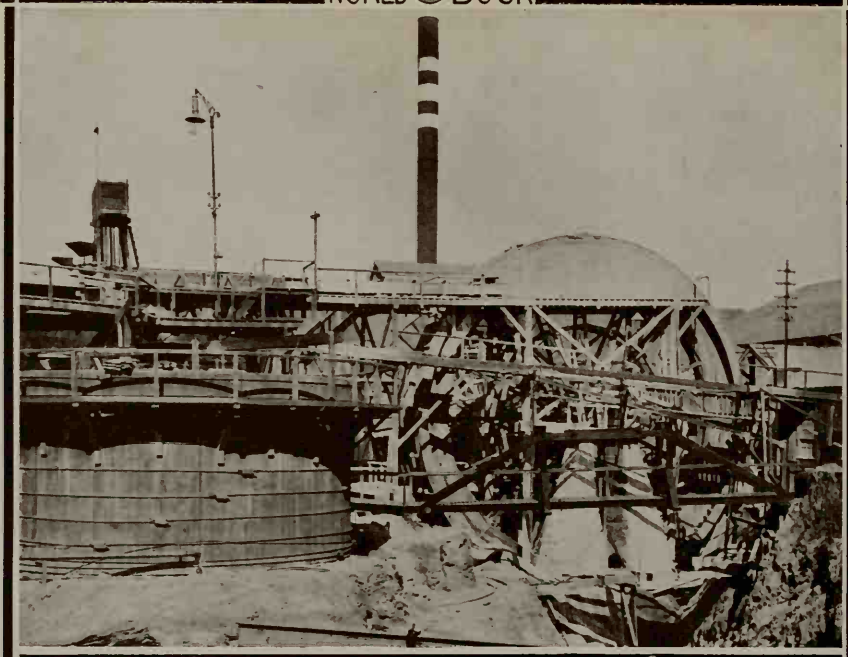


IN SOUTH AFRICA.

Above: Mill for crushing gold ore. Below: A section of a gold mine 2,100 feet underground. Both at Johannesburg.

In medieval times it played a great part in history, for a whole science was built around it—the science of *alchemy*. Gold was the most perfect substance in the world, the alchemists declared, and they used their science and their magic in vain attempts to find some means of turning other metals into it. With the growth of science and the understanding of the principles of chemical elements, it became clear that such transformation could not be brought about. The knowledge of the properties of gold acquired by the alchemists in their vain search has served as a basis for a more scientific study of this very interesting and useful metal.

Its Properties. First of all, it is a chemical element; that is, it cannot by any known means be separated into simpler components. It is a bright yellow, lustrous, very heavy metal (19.31 times heavier than water), and it melts at a temperature of about 1945° F. If subjected to a much higher temperature it gives off a vapor with a greenish-yellow color. It has been estimated that the boiling point would be 4585° F. Electricity and heat both pass through it readily; in other words, it is a good conductor, but needless to say it is seldom put to any of the practical everyday uses to which any of the cheaper metals are equally well suited. No other metal has ever been found which is so satisfactory for coins of high value, for jewelry and ornaments and for dentistry, and most of the gold mined is used for these purposes, for gilding or lettering, and for coloring glass and chinaware. About one-fourth of each year's production of gold, it is estimated, is used for coins.

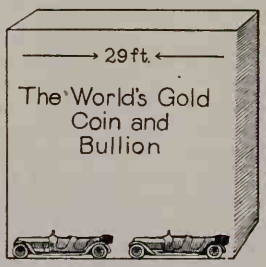
In its pure state gold has one quality which unfits it for hard usage—it is soft; and consequently it is almost always mixed with a harder metal, the mixture being known as an alloy. A finger ring of pure gold would not hold its shape well; a coin of pure gold would wear away quickly; so in making the former a mixture of silver is used, and for the latter about eight to ten per cent of copper. Copper deepens and reddens the color, while silver lightens it, and the proportion of either of these metals used in an alloy is determined in part by the color desired. The pureness of gold used for jewelry is measured in *carats*, and "twenty-four carats" is the standard of measurement, for it means absolute pureness. In nearly all countries gold coins are made nine-tenths pure. The Austrian ducat has 98.6 per cent of gold and 1.4 per cent of copper. The British sovereign, which is 91.7 per cent gold and 8.3 per cent copper, contains twenty-two carats; the American gold coin of ninety per cent gold and ten per cent copper contains 21.6 carats. Most twenty-carat gold has twenty parts of gold to four of a harder metal; eighteen-carat gold has two less; but articles made of this alloy have a right to be called "solid gold," for this simply means that they are of gold or the gold alloy all through, rather than having a plating of gold over a basis of some cheaper material.

Gold has two properties which are far more interesting than any of those mentioned above. It can be hammered out into a sheet of incredible thinness, or, to speak technically, it is the most *malleable* of the metals (see subheads *Gold-Beating* and *Gold Leaf* below); and it is extremely ductile—that is, it can be drawn out to a great length without breaking. As regards this latter quality, skilful operators have drawn gold out into such a tiny wire that it takes 680 feet of it to weigh one grain or about 900 miles to weigh a pound avoirdupois. But the gold, to be thus treated, must be pure. If one two-thousandth of its weight of lead, for instance, be added to the gold, the wire cannot be made.

Gold in Chemistry. Like every other element, gold has its chemical symbol, or "nickname," for it would be unwieldly in speaking of chemical compounds always to use the full name of every element; and since the Latin name for gold is *aurum*, its symbol is the abbreviation *Au*. In the paragraph above, mention is made of some of the alloys of gold, and the article ALLOY has more to say on the same subject. Now many of the alloys are mixtures and not chemical compounds; that is, each substance which enters into the alloy keeps its own individuality and properties. This is true of the alloys of gold with silver and copper and also of gold amalgam (the alloy with mercury). But gold does combine with certain substances to make real compounds. With aluminum it forms a brittle purple, and with zinc a brittle violet, compound. Alloys with iron, used in jewelry in France, are known as gray gold and blue gold on account of the modifications of the yellow color resulting from the formation of alloys.

Looking at gold and touching it, it would seem that so solid and heavy a substance could not be dissolved, and indeed most acids or other liquids have no more effect on it than

does water. On account of its resistance to oxidation, the alchemists called gold a *noble* metal or *the king of metals*. However, chlorine it cannot resist, and in water saturated with that gas it is dissolved as readily as is salt in hot water. A mixture of nitric and hydrochloric acid also dissolves gold readily, owing to the liberation of chlorine by the interaction of the two acids. On account of this effect on the royal metal the alchemists named this mixture of acids *aqua regia*, that is, the *royal water*. When this solution is evaporated yellow crystals of auric chloride are obtained. This gold chloride is used in "toning" (that is, modifying the color of) photographs. In the presence of air, a solution of sodium (or potassium) cyanide dissolves gold. This fact is utilized in extracting the metal from its ores.



THE GOLD OF THE WORLD

All the money of the world, except that of the few countries which have a silver, nickel or paper standard, is based on about $8,000,000,000 in gold. A cube of gold of this value would measure twenty-nine feet on each edge. The large automobiles in the illustration help to a realization of the size of such a solid.

How Gold Exists in Nature. Long, long ago, people did not delve deep in the earth for their supply of gold. They just took what nature had left ready for them on the surface. Gold was frequently found then, as it is sometimes found to-day, mixed with the sand and gravel along a river course. When so found it is in a pure state or mixed with silver, and occurs in all sizes from tiny particles like grains of glistening sand to nuggets of fair size. So far as is known, the largest nugget ever found thus free in the sand and gravel was discovered in Victoria, Australia, and weighed 183 pounds. It is hard to conceive of the intense excitement which must have prevailed when this $50,000 lump of gold was picked up.

To obtain gold from such alluvial sources, only a simple washing is necessary. These surface deposits are called *placer* mines, and most of them are shallow and quickly exhausted. Naturally they are the more conspicuous and enticing sources of gold, and in almost every case where the discovery of gold has been followed by the rush of thousands to the spot, it has been metal of this easily attainable variety that has been first sought. The "forty-niners," for example, who formed the endless caravan across the desert to California, were seeking "placer" gold, and the first findings in the Klondike region, in Australia and in South Africa were of the same variety. At first, every man washed his own gold in a simple sheet-iron *pan*, but later hydraulic machinery was introduced—powerful machinery which by means of its forcibly-driven streams of water tears out gravel and soil and boulders in the gold-bearing regions and, by a system of gratings, separates the gold from the worthless material. This is a wasteful process—wasteful not of gold, but of soil—and it has been practically forbidden in well-settled places, as in California. To take its place, in sections where placer gold exists, another method, which employs dredges, has been introduced.

All gold does not exist in this free state. Much of it exists in ores or gold-bearing rock, and must be mined like any other metal, by means of great shafts sunk into the earth. In Western Australia, Transylvania and Colorado large quantities of a compound of gold with tellurium (formula $Au\ Te_2$) are found. This is a gray or black ore, though an admixture of free gold sometimes gives it a brassy color. Gold-bearing ores are especially plentiful in mountainous regions.

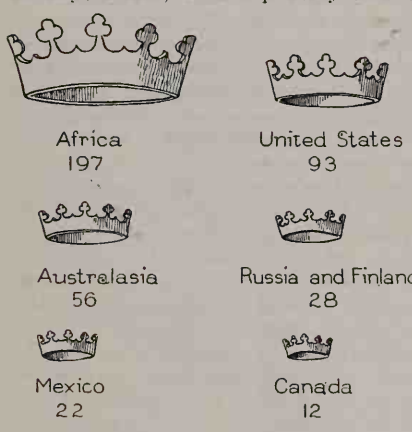
Taking Gold from the Ores. After the rock with its precious admixture of gold is brought to the surface, there remains much to be done before the gold is in an easily recognizable state.

The miner has no nuggets of pure gold to carry about in his pocket, or to tie up into a long string in the fascinating manner of a Bret Harte hero; it was placer gold entirely with which these men dealt. The treatment given gold-bearing ore depends largely on what other substances enter into its composition, but the preliminary process is usually the same. The ore is crushed and ground to a fine powder by a stamping machine, and is then passed over copper plates covered with mercury. This substance has a strong affinity for gold, and as the ore passes over it, it draws out the gold particles and lets the other material pass by. The pulpy mass of mercury and gold which results is known as *amalgam*. This is first squeezed, to force out the excess mercury, and the hard amalgam which remains is heated until the mercury distils and passes off in vapor, leaving the gold.

There are other processes of extraction in which the gold is dissolved by chlorine or by cyanides and afterwards reprecipitated from the solution, but these are more complicated than the amalgamation process described above. Frequently they are used in combination with the above, to recover the gold which the mercury has allowed to escape.

Where Gold Is Found. Gold is widely distributed over the earth, and wherever it is known or believed to be, men are certain to find their way. In the fifteenth and sixteenth centuries there was a legend which told of a wondrous region called El Dorado, "the golden," where gold was reputed to be as common as sand, and many of the exploring parties which set out from Europe during that period of romance and adventure were in quest of that marvelous country. They never found it, but in the nineteenth century several discoveries were made which caused people to exclaim at first, "El Dorado, surely;" for so rich did the possibilities seem in California, in Australasia, in Alaska, in South Africa.

At present there is approximately $460,000,000 worth of gold produced in the world annually: that is, there is probably twice as much mined each year as existed in the whole of Europe at the time America was discovered. Of this vast amount Africa produces over forty per cent; the United States, including Alaska, over twenty per cent, more than $90,000,000 worth; Australia and New Zealand, twelve per cent and Russia about six per cent. It is believed that certain countries of South America are capable of considerable development as gold-mining countries. The world's stock of gold in 1917 was estimated at $16,000,000,000, one-half of which is supposed to be in coin and bullion.



THE ANNUAL PRODUCTION

The proportionate sizes of the golden symbols are helpful in comparing the production of gold in the leading countries.

United States. Though gold has been found in the eastern slope of the Appalachian Mountains, the production in the United States is largely in the Western mountain country. California, Colorado, Alaska and Nevada are the richest gold-producing regions, though South Dakota, Arizona, and Montana and Utah have an annual yield of several million dollars each. For many years after the sensational discovery of gold in 1848, California was without a rival as a gold-producing state, but in more recent times Colorado, Nevada and Alaska have challenged its supremacy.

Canada. The Dominion produces about one-eighth as much gold as does the United States. Ontario, British Columbia and Yukon are the largest producers among the Canadian provinces. The production in 1915 was more than double that in 1907, but was not so great as that in any of the four years from 1899 to 1902, when the placer deposits of the Klondike in the Yukon district were producing so abundantly.

Africa and Australasia. The greatest gold-field in the world, so far as is known, is in the Transvaal, in South Africa; Rhodesia and the Gold Coast yield amounts which are small in comparison to the rich stores from that more-favored land.

In Australasia the placer mines have been for the most part exhausted, but the deep mines still yield splendidly. Western Australia ranks first among the states, with an annual yield of about $25,000,000, Victoria, Queensland and New Zealand each averaging not more than a third of that amount.

Gold-Beating. As stated above, gold is so malleable that it can be hammered into very thin sheets—so thin that it takes more than 367,000 to make a pile an inch high! The process by which these thin sheets are made is known as *gold-beating*, and is carried on as follows:

A very small amount of either copper or silver, according to the color desired, is mixed with the gold, which is subjected to a very great heat to render it more malleable. It is then cast into a bar, which is passed between rollers and flattened into a ribbon one-eight-

hundredth of an inch in thickness. This is cut into pieces about one inch square, which are laid between leaves of a very thin, tough paper. Exactly in the middle of each leaf the gold is placed, and the alternation of paper and gold is continued until there are 210 sheets of gold in the little pile, which is called a *cutch*. This is bound in parchment, laid on a marble block and beaten for twenty minutes with a large hammer which weighs sixteen or seventeen pounds. So much elasticity has the cutch that the hammer actually rebounds, and does not need to be lifted.

When the first beating stops, the little gold sheets are three and one-half inches square. Each one is then cut into four squares, and these are placed between leaves of gold-beater's skin, a special membrane prepared from the intestine of the ox. The beating is continued with a ten-pound hammer for about two hours; the gold sheets are again taken out and quartered; and a third beating with a seven-pound hammer reduces them after about four hours to their final state, when they are known as gold leaf.

Gold Leaf. The incredibly thin leaves, through which the light can now filter, are taken up with wooden pincers, laid on a leather cushion, and trimmed with a knife made of rattan to sheets three and one-half inches square. Twenty-five of these, between sheets of paper, make up a "book," and the books are sold in packs of twenty, the wholesale price of a pack averaging a little more than seven dollars. As the cost of the gold thus used is somewhat over four dollars, and as the long and tedious process must all be carried on by hand, it may be seen that the profit is not excessive. The ordinary gold leaf of commerce is not reduced to the very minimum thinness, but each one is about $\frac{1}{200000}$ of an inch in thickness.

Gold leaf as used in the arts is familiar to everybody. It appears in the lettering on book covers, on picture frames, on furniture, on pottery—everywhere, in fact, where gilding is used; for most gilding is done by means of gold leaf. On the Egyptian mummy cases which have lain in the tombs for thousands and thousands of years, there are numerous examples of such gilding, which show that the ancients must have understood gold-beating almost as well as do modern artisans.

Dentists, too, use large quantities of gold leaf, as that is the form in which their material for fillings comes to them. Theirs, however, is not the very thinnest variety, as the beating is not carried beyond the cutch stage, and it must be pure gold and not an alloy.

Gold lace consists of very fine strips of gold twined around silk. It contains only about two and one-half per cent of gold. Precipitated gold (purple of Cassius) is used in the manufacture of ruby glass. A.MC C.

Consult Curle's *Gold Mines of the World;* Kemp's *Ore Deposits of the United States.*

Related Subjects. Further information connected with gold may be obtained from the following articles in these volumes:

Alchemy	Ductility
Alloy	Gravity, Specific
Amalgam	Malleability
Carat	Mining
Chemistry	Money

GOLD COAST, a British colony in West Africa, with a coast line of 334 miles, extending along the Gulf of Guinea. It owes its name to the abundance of gold found in all parts of the colony. The area of the Gold Coast itself is about 25,000 square miles, but with Ashanti and the Northern Territory annexed in 1901, the area is nearly 81,000 square miles. The climate is very unhealthful, and few Europeans can withstand the deadly fevers prevalent in all parts of the colony. The soil is wonderfully fertile, and produces coffee, cocoa, tobacco, cotton and spices. The chief exports are gold, copra, palm oil, rubber and cocoa. The colony is divided into three provinces, Western, Central and Eastern, administered by resident commissioners, who are responsible to the governor of Cape Coast Colony, appointed by the British Crown. Ashanti and the Northern Territory each have separate chief commissioners. The chief towns are Coomassie, capital of Ashanti, Accra, Cape Coast Castle, Seecondee, Quittah, and Winnebah. Population in 1911, 1,503,386.

GOLDEN AGE, a term used to represent the period of highest development in literature and art in a country. The Romans used it to describe the ideal time when, under Saturn's reign, the earth produced without cultivation, and happiness, peace and sinlessness prevailed. It is broadly applied to the fanciful era, usually of extreme youth, before one's illusions are lost.

GOLDEN BULL, a term applied in a general way to any state document bearing a golden seal. The word is from the Latin *bulla aurea,* so called from the golden case in which the seal attached to the bull, or document, was inclosed. One golden bull in particular relates

the edict issued in 1356 by Charles IV of Germany for the purpose of decreasing the confusion attending imperial elections. The decree limited the number of electors to seven (three prelates and four lay princes). Frankfort was declared to be the place of election, and Aix-la-Chapelle that of coronation. The important questions of the dependence of the imperial office on the Pope, and the latter's authority to investigate and approve elections, were ignored.

GOLDEN FLEECE, in Greek mythology, a fleece of gold which was guarded by a dragon in a grove sacred to Mars, in the city of Colchis, on the shore of the Black Sea. That Jason might prove himself worthy of the throne of Iolcus, which he claimed from the usurper Pelias, his uncle, he was commissioned to bring back the Golden Fleece. He started on this perilous adventure with a band of heroes, who sailed in the ship *Argo*. Many were the thrilling experiences which the Argonauts encountered, but Jason secured the Fleece and returned to Iolcus to demand the abdication of the wicked Pelias. See ARGONAUTS; JASON.

GOLDEN GATE, THE, the picturesque channel which connects San Francisco Bay with the Pacific Ocean. Anyone who has crossed the bay, even in an unromantic ferry boat, and has looked out through the Golden Gate at

THE GOLDEN GATE

sunset has seen a picture which he is not likely to forget. The channel is in effect but a mountain pass—a mountain pass with a branch of the ocean overspreading it. On either side the mountains which border the great bay break off rather abruptly, forming bold promontories, "on which the sea breaks heavily." The passage between, which is deep enough to admit the largest seagoing steamers into the peaceful harbor, is one mile wide and four miles long. Some accounts say that Drake named the Golden Gate far back in the sixteenth century, but J. C. Fremont in his *Memoirs* claims the honor for himself. See SAN FRANCISCO.

GOLDEN HORN, a name given to a beautiful harbor, an inlet of the Bosporus, on which stands the city of Constantinople. It is six miles long, about half a mile wide at the widest part, and more resembles a river than a har-

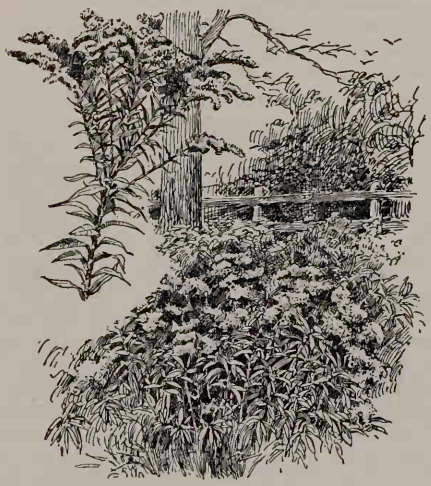
THE GOLDEN HORN

bor. It is deep, well sheltered and capable of accommodating 1,200 large ships at anchor. On the eastern shore of the Golden Horn are the beautiful suburbs of Pera and Galata. The city of Constantinople now consists of a collection of towns and villages on both sides of the Golden Horn, Galata, magnificently situated overlooking the harbor, being the modern business center—the location of banks, post offices and steamship offices. Pera is the residential section, occupied by European business men and embassies and the most modern and fashionable hotels and shops.

There is an old expression to the effect that when one has seen Naples he may be content to die, as nothing more beautiful remains to be seen. The fascination of the Golden Horn is equally great, and its beauties, once seen, can never be forgotten. For illustration of the great city, see CONSTANTINOPLE. F.ST.A.

GOLDENROD, the most familiar and abundant of North American late summer and early autumn wild flowers. It is such a general favorite that it has been chosen the national flower of the United States, and the state flower of Alabama, Iowa, Kentucky, Missouri, North Dakota and Nebraska. It has a slender, wandlike stem, smooth or hairy, which bears thick clusters or graceful plumes of compound, bright yellow, deep golden or white flowers. The leaves, smooth or hairy, even or tooth-edged, may be seen swaying by dry roadsides,

in moist woods, in swamps and peat bogs or in cultivated gardens. There are about a hundred species, some of the commonest being the *early goldenrod,* often dried for interior



Because its myriad glimmering plumes
Like a great army's stir and wave;
Because its golden billow blooms,
The poor man's barren walks to lave:
Because its sun-shaped blossoms show
How souls receive the light of God,
And unto earth give back that glow—
I thank Him for the Goldenrod.
—LUCY LARCOM: *Goldenrod.*

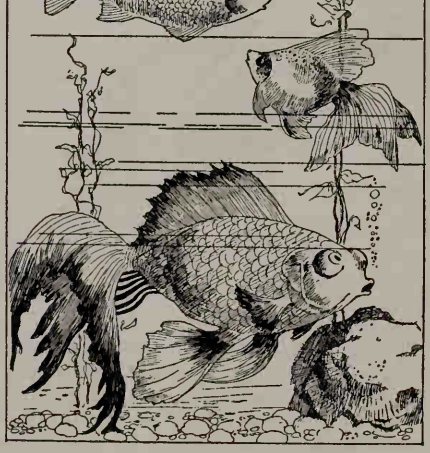
decoration; the large, handsome *Canada goldenrod;* the showy *seaside goldenrod,* and the *lance-leaved* or *fragrant goldenrod.*

Various species of this flower are valued as forage. The Canada goldenrod yields a strong fiber, but it is not used commercially. The leaves of another species, the *sweet goldenrod* or *Blue Mountain tea,* have been used as tea and yield an oil employed in medicine as a tonic. A few species are found in Great Britain and Europe.

GOLD'FINCH, a joyous little songster of Eastern North America, about the size of the canary and, like that sweet singer, cheerily clothed in bright yellow. The goldfinch rejoices also in black wings and a black crown and tail, the latter varied with markings of white and gray. Its gay and ringing notes—*per-chic-o-ree, per-chic-o-ree*—are uttered with a joyous abandon that the cage bird can never equal. These merry songsters nest from Southern Manitoba, Central Quebec and Newfoundland south to Eastern Colorado, Southern Oklahoma, Central Arkansas and Northern Georgia, wintering over most of their breeding range and as far south as the Gulf of Mexico. The nest, made of grass, bark and moss and lined with thistledown, is placed in a tree or bush. Three to six pale, bluish eggs are laid in June or July. The birds love to seek their food, the seed-bearing plants, in the field and garden, where "the old sunflowers rattle before their vigorous attack and the thistles spring into sudden blossom of black and gold as they swing from the nodding heads." The goldfinch's span of life is about fifteen years.

The *European goldfinch,* which resembles its American cousin in habits, is cinnamon-brown on the back, and has a black crown, black wings marked with yellow, a black tail and white underparts. About the base of the bill is an area of bright red. It ranges throughout Europe except in the regions farthest north, and a few specimens have been seen in New Jersey, New York and Massachusetts. Its eggs, four or five in number, are white, marked with purple. This bird is a favorite cage songster in European homes.

GOLDFISH, a species of carp, kept in aquariums for their beauty in nearly all civilized parts of the world. Thousands of years ago all of this species were of greenish color, but one day, in China, several of rather golden



THREE FORMS OF GOLDFISH

hue were noticed in a pond. So through careful breeding of these, and through selection, a new race of fish was started, and in China the rearing of goldfish has become a science. From

those greenish ancestors have sprung the darting creatures of aquariums everywhere, gleaming pure gold in the sunshine.

Goldfish can be purchased for from ten to twenty-five cents each, depending chiefly on the size. They grow to about five or six inches in length, and have been known to live ten years in an aquarium. They may live a hundred years under perfect natural conditions. They should be placed in water, not too cold, in which some water-plant is growing and to which a little fresh water is added each day, and should be given a little sunshine, and fed the prepared food sold for the purpose.

GOLD LACE, a handsome fabric woven of gilded silk thread, used for decorating uniforms, liveries, altar cloths and ecclesiastical robes, banners and theatrical dress, as well as for ornamentation in women's apparel. To make the thread, a rod of silver is covered with gold leaf and drawn between perforated diamonds or rubies to make it into a fine wire. The finest of such wire is so delicate that a mile and a quarter of it weighs only an ounce. It is then wound around with silk thread, and the resulting thread of golden luster is woven into lace. *Silver lace* is similarly made.

GOLDSMITH, Oliver (1728-1774), an English story-writer, essayist, dramatist and poet, the author of one of the earliest English novels, *The Vicar of Wakefield,* and one of the best comedies of the eighteenth century, *She Stoops to Conquer.* The latter still holds the favor of the public because of its uproarious fun. As a poet he is remembered chiefly for *The Deserted Village,* a poem which touchingly describes the decay of the little town where he spent his boyhood. Its opening lines are:

Sweet Auburn! loveliest village of the plain,
Where health and plenty cheered the laboring swain,
Where smiling spring its earliest visit paid
And parting summer's lingering blooms delayed.
Dear lovely bowers of innocence and ease,
Seats of my youth, when every spot could please,
How often have I loitered o'er thy green,
Where humble happiness endeared each scene.

The Deserted Village and *The Vicar of Wakefield* both show a departure from the artificial standards of the eighteenth century; in its sincerity and sympathy for nature and humanity, the former belongs rather to the new school of the nineteenth century (see Romanticism). *The Vicar of Wakefield,* a delightful narrative of village life, is aimless in plot and weakened by absurdities, but it is justly admired for its simple and charming style, engaging humor and excellent character drawing. Dr. Primrose, the vicar of Wakefield, is one of the enduring creations in English fiction.

OLIVER GOLDSMITH
Much of his work is included among the literary treasures of English-speaking people. He wrote with grace and sweetness, and tender, pathetic charm.

Goldsmith was born in Ireland, the son of a poor curate who is pictured in the country parson of *The Deserted Village.* He was a lazy and indifferent student, and his teachers called him a dullard. In 1744 he entered Trinity College, Dublin, obtained a degree five years later, and after his graduation made a trial of several professions, including the ministry, teaching and medicine. In none of these did he meet with success. The years between 1753 and 1756 he spent in wandering about Europe, where he sometimes earned his bread and lodging by playing the flute for dancing peasants.

Finally he took up literature, the one calling for which he was suited. Beginning as a hack-writer for London booksellers, he soon won the notice of the great Samuel Johnson (which see), who was charmed by the delightful style of his letters, published in 1760 and the year following under the title, *A Citizen of the World.* It was not long before Goldsmith found himself a member of the famous Literary Club to which belonged the greatest writers and artists of the period. In 1764 he established his fame with the publication of *The Traveller,* a poem equal in merit to *The Deserted Village,* though it has never become so popular. His literary work continued until his premature death, in his forty-seventh year. Among his writings not mentioned above are several school histories, more attractively written than accurate, and a comedy, *The Good-Natured Man.*

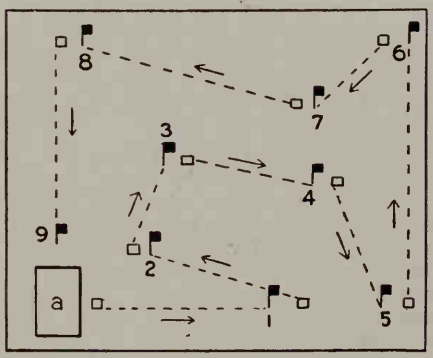
Goldsmith's conversation had little of the charm of his writings, and his friends took great delight in an "epitaph" which said,

Here lies Nolly Goldsmith, for shortness called Noll,
Who wrote like an angel and talked like poor Poll.

Consult Dobson's *Great Writers;* Kelly's *Early Haunts of Oliver Goldsmith.*

GOLF, a popular game for both sexes, played in large spaces in the great out-of-doors, under conditions which promote bodily health, develop physical control and increase mental alertness. There are comparatively few playing grounds, or *courses*, because even a "short course" requires at least sixty to seventy acres of ground, while a "long course" needs 150 acres or more, to give players the fullest measure of enjoyment and opportunity to develop masterful playing. This fact renders it practically impossible to popularize the game except in thickly-populated centers, where a hundred or more people may combine to lease or purchase the needed ground and prepare it for use.

The Course. The playing field does not require stated dimensions or regular shape. A so-called "short course" demands sufficient space to locate nine "holes" from 100 yards to 500 yards apart. The direct distance between



A NINE-HOLE COURSE

(*a*) Club house, close to which is the starting point, or first "tee."

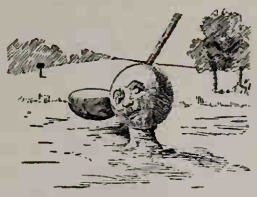
the holes must be on lines that are not crossed or closely approached by each other. This latter is a requirement for the safety of the players; those on any part of the course must feel secure from flying shots from the clubs of other players. It is always desired that the distances between holes shall vary as much as possible; more skill is then demanded in judging shots. Whether the course be one of nine holes—a *short course*—or of eighteen holes—a *long course*—the arrangement should be such that the last hole is near the starting point. In the first half of the game the participants are "playing out," or moving away from the starting point; in the second half they are "playing in," or approaching the point from which they began to play.

The field may be entirely level, a condition favored by beginners, or it may be quite hilly and wooded in places. The hazards of the game increase with the difficulties the surface of the course presents. On flat courses artificial mounds of earth, called *bunkers*, are reared to develop greater playing skill; these are also given the general term *hazards*. In front of a hazard a long, narrow pit may be dug to a depth of over a foot and its bottom covered with several inches of shifting sand. This adds greatly to the difficulties of the unfortunate player whose ball falls into the pit, for several shots may be wasted before the ball is again on the fairway.

Each hole is really a metal cup four inches in diameter and of equal depth, sunk into the ground until its top is level with the surface. The ball must be knocked into the cup, a feat requiring considerable skill. To facilitate this play the turf on all sides of the cup for about thirty feet is made very smooth. It is usually heavily grassed, and the grass is kept closely cut; sometimes, however, it is a hard clay surface. This square is called the *green*, and the play on the ball towards the cup from any point on the green is called *putting* (the *u* is given the short sound).

The Game. One person may play alone—a "single;" two may play a match game—a "twosome;" three—a "threesome;" or four—a "foursome." Only once in playing each hole

may the ball be placed definitely in position for a stroke, and that is for the first stroke off each starting place, or *tee*. In these instances a small mound of sand about an inch high may serve as a base upon which to rest the ball. The ball is then struck by a club called the *driver;* it is sent as nearly as possible in the direction of the first hole, and at the spot where it drops, another club, the *midiron, cleek, brassie, niblick* or other of special shape, is called into service to advance it once more towards the cup. These clubs are classified below. Each attempt to hit the ball, whether successful or not, counts as one *stroke;* the person who puts his ball into the cup with the fewest strokes wins the hole, and the one with the lowest score for the total number of holes wins the game; this method of scoring is called "medal" play. Sometimes, by agreement, a game may be decided upon *holes won* rather than upon the number of strokes; this is "match play."



"Now for an awful bump!"

When each of a group of players has "holed out" of the first cup, all move a few feet to the second tee, or second starting place, and proceed to drive in the same manner as from the first tee. Thus the game continues through the nine or the eighteen holes.

A ball shot into shrubbery or behind trees, from which position it cannot be struck, may be picked up and thrown into the fairway, with a penalty of one stroke; if it lands in a sand pit or in any other position where the use of a club is possible it must not be touched by the hand. If a ball is lost another may be put into play, with a penalty of one stroke; when this is done the new ball is placed on the fairway in the supposed location of the one that was lost.

Implements of the Game. The all-necessary implement is the ball. It is nearly two inches in diameter, with surface roughened to resist slipping on impact with the club. The covering is gutta-percha, the interior a semi-elastic composition. In some balls the core is hollowed and contains a fluid; this adds to their resiliency.

The golf enthusiast is tempted to fill his golf bag—cylindrical in form, about six inches in diameter and three feet long—with eight or ten clubs, each of which has its peculiar uses, but not all of which are essential. Every player should have four clubs, but a few, lacking desire to excel, use but two, a midiron and a putter. The clubs average forty inches in length, varying somewhat to meet the needs of players; those considered most necessary are the following:

"He'll never find me!"

Driver. This is one of two clubs having a wooden head, the other being the *brassie.* The player who follows the best traditions of the game invariably uses the driver on the ball at the tee.

Midiron. The midiron is so called because it is the club most used in drives in midfield, when the green to be approached is from 100 to 150 yards ahead. The iron head is bent to a slight angle, to elevate the ball only enough to assure good distance in the drive.

Mashie, or Lofter. Frequently a bunker, sand pit, tree or other hazard lies across the path, and the shot must go above it. A club with an iron head bent more obliquely than the midiron is then required; the mashie raises the ball into the air; the player sacrifices distance to secure height.

Putter. This club has a shorter handle than any other, and is used only after the ball has been shot upon the green. The short handle requires the player to lean towards the ground, from which position he can the better judge the direction and strength of stroke required to sink the ball into the cup.

Other clubs are found desirable by almost all classes of players. The two first named below are particularly recommended:

Brassie. This club is of wood and differs from the driver in that its driving surface is slightly more oblique, to loft the ball, and its base is brass-covered, that it may slip over the turf without friction. It is used in the fairway when considerable distance is desired.

Niblick. A spoon-shaped club with broad flat side to receive the impact is a useful tool with which to loft the ball sharply out of a pit or over a close and high obstruction. The pitch of the spoon is more oblique than that of any other club.

Professional players and very ambitious amateurs use all of the above clubs and sometimes others, of doubtful value to the average player. The *cleek,* with an iron head set perpendicularly, assures great forward distance, with little rise above the ground. Few players succeed with it, as their shots are likely to fly low and be stopped by the grass.

To Develop Good "Form." An article of this nature cannot give playing rules or directions the "golfer" should follow. How to stand beside the ball, how to handle the clubs, how to effect a stroke—all these require technical descriptions which the novice sometimes finds difficult to interpret. The best way to secure improvement is to study carefully the methods of the best players, unless one is able to hire a professional for a number of lessons.

"I'm a sinker!"

Golf when entered upon in the proper spirit compels courtesy, patience, control of the emotions and prompt acknowledgment of the rights of others.

Brief History. It is believed that a game similar to modern golf originated with the Dutch, but credit belongs to Scotland for developing it to its present standards and handing down its traditions. Formerly it was solely a "gentleman's game," reserved to few men, whose wealth made great courses possible. These men observed to the highest degree the ethical and social requirements so dear to the Scotch golfer, and with such a standard the game reached America in 1888. For many years only men of leisure played; the participation of women did not follow for a dozen years. Gradually in city parks golf courses were laid out, and the response of the general public was instantaneous. By 1910 many women were playing, their number constantly increasing until on some city courses the sexes are nearly equally represented. Chicago is reputed to hold a greater proportion of players to the total number of inhabitants than any other city in America; there the public courses are so crowded that on rest days people are in line at two o'clock in the morning to secure early playing privileges. There are in that city seven public courses, and within twenty miles of the business center over thirty private courses are maintained. New York City provides three public courses, but within a short distance from the center of business there are over a hundred private clubs. E.D.F.

Consult Clark's *Golf: A Royal and Ancient Game;* Hutchinson's *The New Book of Golf;* Travers's *The Travers Golf Book.*

GOLI'ATH, the giant from Gath, famous only for the fact that he was killed by the youth David (which see). The Philistines had come up to make war against Saul, and as the rival camps lay opposite each other this giant came out each day to challenge one of his enemy in single combat. Finally David, armed simply with a sling and pebbles, went out and quickly slew him. Then all the Philistines, upon seeing their champion killed, were disheartened and easily put to flight. See GIANTS.

GOMEZ Y BAEZ, *go maze' e bah'aze,* MAXIMO (1826-1905), a general of Cuban insurgents, was born at Bani, Santo Domingo. In the revolt of the island against Spain in 1844, he served as a lieutenant of cavalry in the Spanish army, which he accompanied to Cuba but afterwards left on account of General Villar's abuse of some Cuban refugees. In 1868 he joined the Cuban rebellion, and became a major-general. He was instrumental in bringing about the insurrection of 1895, and was made commander-in-chief of the Cuban army. In the Spanish-American War in 1898, when the Americans landed in Cuba, he gladly coöperated with them, placed his force of soldiers at their command and remained on terms of friendship with them throughout the campaign. In the same year he was deprived of his command by the Cuban Assembly, who believed that his acceptance of $3,000,000 for his army from the United States constituted an act of disloyalty. Gomez was at one time mentioned as a candidate for the presidency of the Cuban republic.

GOMPERS, *gom'perz,* SAMUEL (1850-), an American labor leader whose efforts in behalf of organized labor have brought him into national prominence. He was one of the organizers of the American Federation of Labor, and, with the exception of the year 1894, has served continuously as its president since 1882. He was also elected first vice-president of the National Civic Federation. Gompers was born in London, but emigrated to America when he was thirteen years old; a year later he began his association with organized labor by becoming the first registered member of the Cigar-Makers' International

SAMUEL GOMPERS

Union. This organization became through his efforts one of the most successful trade unions.

His aim has been to work along constructive lines and to promote industrial arbitration, and he has used his influence to secure legislation favorable to the working classes. With other officers of the American Federation he was sentenced to a term in prison in 1908 for refusing to take the name of the Buck Stove & Range Company from the boycott list in the official organ of the union, but after several appeals the case was dismissed in 1914 by the United States Supreme Court. It is worthy of note that he was almost the only labor leader of national influence in 1916 who advocated military preparedness for his country, a movement which was generally opposed by organized labor. Gompers is the author of several pamphlets on the labor question, and of *Labor in Europe and America.* See LABOR ORGANIZATIONS.

GON'DOLA, a curiously shaped and often highly ornamented, silently moving boat or barge-cab of Venice, the water-city—that favorite subject of painters. The typical gondola is a flat-bottomed boat about thirty feet long

ON THE CANALS OF VENICE

by four feet wide, each end curved perpendicularly upward to about the height of a man, and ending in a sharp point. Toward the middle there is a gaily curtained chamber for passengers. Usually there is but one boatman, called a *gondolier,* who faces the bow and propels the boat quickly and deftly with a forward stroke of an oar. In accordance with an ancient law passed to prevent extravagance and competition in the decoration of gondolas, all are painted black except those of high officials. In his *Beppo,* Byron paints a word picture of the gondola.

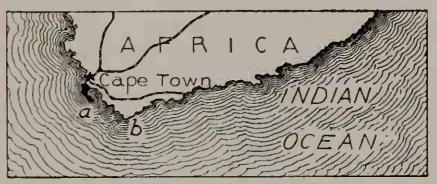
This picturesque means of conveyance is now being replaced to a great extent in Venice by noisy little gasoline launches. The origin of the name *gondola* is disputed. See VENICE.

GONSALVO DE CORDOVA, *gohn sahl' vo day kohr' do va,* GONZALO HERNANDEZ Y AGUILAR (?1453-1515), a Spanish general called the *Great Captain,* was born at Montilla. He rendered distinguished service in the war of Queen Isabella against Portugal and in the conflict which drove the Moors out of Europe, and was instrumental in bringing about the union of Granada and Castile in 1492. In 1495 he united with Ferdinand, King of Naples, against the French, and in a few months succeeded in vanquishing them. In 1500, when Ferdinand of Aragon and Louis XII of France decided on the conquest of Naples, Gonsalvo led the invading Spaniards and took possession of the kingdom. The conquerors soon quarreled over the division of the booty, and war was declared between them in 1502. Gonsalvo vanquished the French at Cerignola in 1503 and took several important cities, including Naples. He sustained the single defeat of his life at Gaeta, but ultimately drove the French from Naples. Ferdinand then appointed him viceroy of Naples, with absolute authority. He was soon recalled to Spain by the king, who resented his general's growing popularity, and his last years were spent in retirement.

GOO'BER, a popular name applied to the peanut (which see).

GOOD FRIDAY, the anniversary established by religious bodies as a memorial of the Crucifixion of Christ. It is solemnized on the Friday before Easter by churches of many denominations and by various schools and public institutions. Its commemoration is of ancient origin, dating to the time of Constantine, who prohibited all public activities on this day. It is still a legal holiday in Great Britain and Ireland and the British colonies. In the Roman Catholic Church the mass is somewhat different from that read on other days, the Host having been consecrated on the previous day. In the Anglican and Roman Catholic Churches the Three Hours' Devotion service is held between twelve and three o'clock, in commemoration of the agony of Christ upon the cross during those hours. In accordance with the calculations of the Royal Astronomical Society of Berlin, a German scientist has fixed the exact date of the Crucifixion as April 6, A. D. 33.

GOOD HOPE, a cape near the southern extremity of Africa, at the termination of a small peninsula extending south from Table Mountain, which overlooks Cape Town. The cape, locally known as Cape Point, or "the Point,"



CAPE OF GOOD HOPE
(*a*) Cape of Good Hope. The most southerly point of the continent is (*b*) Cape Agulhas.

forms the west side of False Bay, and on its inner or eastern coast is Simon's Bay and Simon's Town, where there is a safe anchorage and a British naval station. Bartholomeu Dias, a Portuguese, who discovered the cape in 1487, called it *Cape of Storms,* but John II of Portugal changed this to its present name, as its discovery aroused a hope of finding a sea route to India. This hope was verified by Vasco da Gama in 1497 when he sailed around the Cape of Good Hope and found his way to Calicut, on the west coast of India.

The Cape of Good Hope is not the most southerly point of Africa. That distinction belongs to Cape Agulhas, about 100 miles to the southeast.

GOOD ROADS MOVEMENT, the name identified with the attempt to secure better roads throughout the United States and Canada. For details, see ROADS AND STREETS, subtitle *The Good Roads Movement.*

GOOD TEM'PLARS, INTERNATIONAL ORDER OF, a fraternal society organized at Fayetteville, N. Y., in 1851, having for its object individual total abstinence and world-wide prohibition of the liquor traffic. The Order was introduced into England in 1868 and soon spread throughout the civilized world, its code being translated into eighteen different languages. The question of the admission of colored persons caused a division in 1874; a section of the society then organized under the name of the *Right Worthy Grand Lodge of the World.* In 1887 the two branches were reunited.

The national prohibition party was formed in 1869 by a committee appointed by the Right Worthy Grand Lodge, and thus the Order was primarily responsible for putting the temperance question into politics; and the Woman's Christian Temperance Union was organized in 1874 by Good Templar women. The Washingtonian Home for Inebriates at Chicago, Ill., and the Orphans' Home at Vallejo, Calif., were founded by this Order. In 1916 the organization comprised two national grand lodges (United States and Canada) and seventy grand lodges, with a total membership of 680,665, including 263,410 in the juvenile branch, distributed over a larger part of the world. Members are required to pledge themselves to the temperance cause.

GOOD WILL, the advantage acquired by a business concern beyond the valuation of its capital, property, stock or funds employed in it. It arises in consequence of business location, the reputation established by honest and fair dealing, and on the assumption that old customers will continue to buy at their accustomed place. Legally, good will may not be assigned or mortgaged, but when a business is sold, the seller is not supposed to enter into the same business again near enough to affect the pecuniary interests of the purchaser. In most states and provinces a written contract to this effect is secured, and if the agreement is broken the former owner of the property is liable to an action for damages.

GOODWIN, NATHANIEL CARL (1857-), an American actor who attained a large measure of success in comedy rôles. He was born in Boston, and made his first appearance in a play entitled *Law in New York.* His second success, *Black-Eyed Susan,* established his reputation as a comedian of the "legitimate" type. Among the other plays in which he assumed leading parts are *A Gold Mine, A Gilded Fool, Nathan Hale, When We Were Twenty-One* and *The Genius.* He was married four times, his second wife being Maxine Elliott, a popular actress; his last union was with Miss Edna Goodrich, also an actress. His first wife died; the others divorced him. He has appeared in vaudeville, telling stories and imitating some of his actor friends; he has also played in leading rôles before the moving-picture camera.

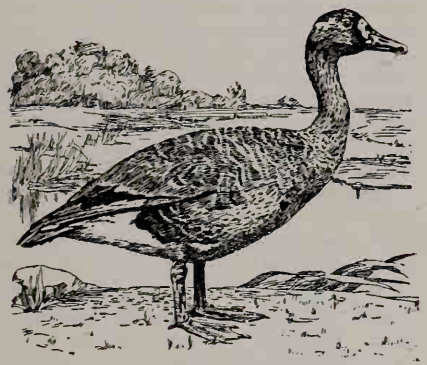
GOOD'YEAR, CHARLES (1800-1860), an American whose work made possible the wonderful development of the rubber industry. Imagine a rubber coat which in winter was so stiff that it would stand unaided, but on a hot summer's day became soft and sticky and if stretched would remain out of shape! Daniel Webster, who was Goodyear's lawyer in his patent suits, had such a coat, and if Goodyear had not spent all his spare time and

money for years in trying to make good rubber, our coats and overshoes to-day might be like it, and automobile tires such as we now have would be unknown.

The discovery which this tireless inventor made was that rubber mixed with sulphur and heated to the melting point is no longer subject to changes of weather. He learned this fact in 1839, after nine years or more of persistent effort in the face of poverty. It was another five years before his process was perfected and could be patented, and then came year after year of lawsuits to protect the patents—suits so expensive that he was never out of debt.

Goodyear was born in New Haven, Conn., though his boyhood was spent in Naugatuck. He became an iron manufacturer in Philadelphia, entering into a partnership with his father, which in 1830 ended in failure. He then turned his attention to rubber, with the result described above.

GOOSE, a web-footed bird closely allied to the swan and duck, and in size ranging between the two. Its neck is longer than that of the duck, but shorter and less gracefully curved than that of the swan. Geese are more at



THE GOOSE

home on land than either swans or ducks, as their legs are longer and placed nearer the middle of the body. Geese are long-lived; in some cases individuals have reached the age of fifty years. There are about forty species found in different parts of the world. In the United States and Canada there are ten or twelve species of wild goose. These are migratory, and early in the spring they fly in wedge-shaped flocks to the northern breeding grounds as far north as the shores of Hudson Bay. Their winter haunts are the Southern United States and Cuba. When on the wing they utter curious *honking* cries. Most geese are vegetable feeders, searching for food on land, frequenting the water less than ducks but often enjoying plants growing in shallow lakes. The Canada goose (which see) is the most numerous of the American species; occasionally when migrating it is seen in flocks of thousands, honking loudly enough to be heard at a distance of several miles.

Domestic geese are descended from the graylag goose of Europe, but by careful breeding have been developed to much greater size and weight. The graylag goose is now scarce, but is found in some parts of Northern Europe. Geese were imported by the early colonists of America. The American wild goose, or "honker," has since been tamed and introduced into Europe. The raising of geese was formerly much more extensively carried on than now; flocks of several thousand guarded by peasants, called gooseherds, were common in England and Europe until recent years. They are highly valued for their flesh and for their feathers, quills and eggs. The flesh is usually roasted. From the livers of fattened geese the delicately-flavored paste known as *pâté de foie gras* is made. The food value of goose is high, the percentage of fat and protein being more than that of beef. This prized game bird is protected from slaughter, except for brief seasons, in nearly all the states and Canadian provinces.

In History and Literature. The story of the sacred geese that saved the city of Rome is one of the most interesting narratives of early Roman history. In 390 B.C. the Romans were attacked by a fierce northern race of people called Gauls. Finally driven to their last place of refuge, a steep, rocky hill known as the Capitol, they prepared to withstand a long siege. One night as the Consul Manlius lay sleeping beside his sword, near the Temple of Juno, where were kept the sacred geese, he was awakened by a clamorous outburst of hissing and cackling. Grasping his sword, Manlius rushed to the walls of the

WEDGE-SHAPED FORMATION

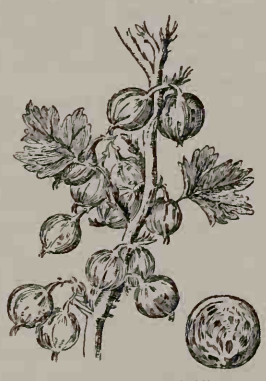
The appearance of geese on the wing when migrating.

fortress and discovered that the enemy had climbed the steep rock and were about to storm the place. Then the other Romans, awakened by the clamor of the frightened birds, hurried from their sleeping places to the spot where the brave consul was defending the walls, and in the battle which followed completely routed the Gauls.

The Christmas goose is often mentioned in English stories; lovers of Dickens' *Christmas Carol* will recall its prominence in that favorite among Christmas tales. One of the old, familiar fables is the story of a goose that laid each day a golden egg. How its greedy master killed it and cut it open, hoping to find in its body untold wealth and found nothing, is often told to impress the lesson that greediness never wins us anything. E.T.S.

Consult Elliott's *Wild Fowl of the United States and British Possessions;* Shaw's *Wild Fowl.* Relating to domestic varieties, consult *Farmers' Bulletin 64,* United States Department of Agriculture, "Ducks and Geese."

GOOSEBERRY, *goos'beri,* an extensively-cultivated oval berry, popular for jelly, jam, marmalade and pies. It belongs to the same genus as the currant and requires practically the same conditions and care. In color it may be white, yellow, green or red, and may be prickly, hairy or smooth.



GOOSEBERRIES

The shrub which bears gooseberries is strong-growing and upright, with very spiny branches, deeply-lobed leaves and greenish-yellow flowers. It is native to Europe and Asia and has been highly cultivated and prized in England. Early pioneers carried varieties of European gooseberries to America, but they soon perished from disease, and the climate did not seem suited to them. In the middle of the nineteenth century, however, the pale red Houghton seedling was produced from a wild North American variety of gooseberry, and that was followed by the large, handsome, pale green Downing. Both species resist mildew and are now widely cultivated. In the United States gooseberries of many varieties are grown in the North-Central, Middle Atlantic and Mountain divisions, Illinois and Missouri being the leading states in production; these two furnish about $85,000 worth yearly. Gooseberries are also grown in Canada; it is estimated that in Ontario the yield brings from $100 to $500 an acre.

The origin of the name gooseberry is disputed, some authorities attributing it to the rough, bristly surface of the wild berries, a quality of goose flesh or goose skin, others saying it is a modification of the word *gorse,* meaning *prickly.*

There are a number of ornamental species of gooseberry, remarkable for their beautiful white flowers, or handsome leaves and fruits.

GOOSEFOOT, or **CHENOPODIUM,** *ke no po' di um,* a genus of plants so called from the shape of the leaves. There are about fifty species, most of them useful natives of Europe and temperate regions in Asia, a few found as troublesome weeds in America. One species, however, known as *wormseed,* is valued in America for oil extracted from the seed and used as a remedy for worms. Another species, known as *quinoa,* furnishes an important article of food in South America.

These plants, with leaves plain or tooth-edged, and small greenish flowers in clusters, are found native in waste places and by roadsides in Europe and Asia. There, the leaves of some are used as a substitute for spinach. Young shoots of others are used as asparagus.

GOPHER, *go'fur,* a name given by the early French settlers of North America to various little digging, gnawing animals whose burrows honeycombed the soil. The true gopher, found in Western North America, is a reddish-brown, molelike animal about ten inches long. It is remarkable for having fur-lined pouches on the sides of its face and neck, extending in some species from mouth to shoulders. These pouches are used for carrying dirt from their burrows and to carry their food of grass, roots, nuts, buds and farm vegetables. The front feet of gophers are well fitted for digging, for they have large claws. Gophers are seldom seen, for they go about at night, but little mounds of earth here and there show their presence in the earth.

A species of gopher found in Gulf states is called *salamander.* The common *striped gopher,* or *prairie squirrel,* of the Western plains is quite a different animal, more closely allied to chipmunks. It does considerable damage

through its burrowing habit. Flooding the burrows or forcing sulphur fumes into them will kill the pests. Animals similar to gophers

THE GOPHER

are found in the plains of India, Russia, Tartary and South Africa.

GORDIAN KNOT, *gawr'di an not,* in ancient mythology, the skilfully-tied knot with which the Phrygian peasant, Gordius, fastened his yoke and cart. According to the legend, this peasant, through the intervention of the gods, was made king of Phrygia. Gordius then dedicated his cart and yoke to Zeus, and oracles foretold that whoever should unloose the complicated knot would be ruler of all Asia. After many unsuccessful attempts of others, Alexander the Great came to Gordium, a city in Phrygia named for Gordius, and cut the knot with his sword, asserting that by so doing he had fulfilled the prophecy. From that originated the expression *cutting the Gordian knot,* meaning to solve a difficult problem with unexpected cleverness.

Gordius was the father of the famous Midas (which see), whose touch turned everything to gold.

GOR'DON, CHARLES GEORGE (1833-1885), an English soldier, called CHINESE GORDON and GORDON PASHA because of illustrious service in China and Egypt, was born at Woolwich. He was educated at Taunton, entered the Royal Military Academy at Woolwich in 1848, obtained a lieutenant's commission upon graduation in 1852, and almost immediately saw active service in the Crimean War. He took part in the expedition to China in 1860, assisted in the capture of Peking and commanded the Chinese force which suppressed the Taiping rebels. In 1873 he was appointed governor of the Sudan, resigning his post in 1880 after his failure to arrange a treaty between Egypt and Abyssinia. In 1884 he was again sent by his government to the Sudan to assist the Khedive in withdrawing the garrisons of the country. He made a gallant defense of Khartum, and was killed two days before the arrival of the relief party under Lord Wolseley. Gordon was a man of deep religious convictions. His diaries and letters have been published.

CHARLES GEORGE GORDON

GORDON, CHARLES WILLIAM (1860-), a novelist and Presbyterian clergyman whose dramatic and realistic stories of life in the Canadian Northwest have brought him into the front rank of Canada's writers. To the thousands who have learned to love his stories he is best known by his pen name of RALPH CONNOR, "a name that covers one of the most honest and genial of the strong characters that are fighting the devil and doing good work for men all over the world." A spiritual touch animates all of his writings, and one feels after reading any of his stories that the author wrote from a sense of deep moral earnestness. The underlying purpose of his work as a novelist is best expressed in his own words, from the preface of *Black Rock,* an early success:

"RALPH CONNOR"

> The men of the book are still there in the mines and lumber camps of the mountains, fighting out that eternal fight for manhood, strong, clean, God-conquered. And, when the west winds blow, to the open ear the sounds of battle come, telling the fortunes of the fight. Because a man's life is all he has, and because the only hope of the brave young West lies in its men, this story is told. It may be that the tragic pity of a broken life may move some to pray, and that the divine power there is in a single brave heart to summon forth hope and courage may move some to fight. If so, this tale is not told in vain.

Charles W. Gordon was the son of a Scotch Presbyterian minister who came to Canada in the early "forties" and settled in a forest section of the County of Glengarry, Ontario. There the author was born. On completing a high school course at Saint Mary's, Ontario, he en-

tered the University of Toronto, and after his graduation studied theology for three years at Knox College, Toronto. In 1890 he was ordained to the Presbyterian ministry, and the same year began a three years' sojourn as a missionary among the miners and lumbermen of the Canadian Northwest Territories. In 1894 he was appointed pastor of Saint Stephen's Presbyterian Church, Winnipeg.

Many honors have come to him, including election to the vice-presidency of the Canadian Society of Authors, and to a fellowship in the Royal Society of Canada.

His deep sympathy with the people among whom he has worked, his understanding of their problems, and his penetration into human nature are revealed strikingly in such stories as *Black Rock, The Sky Pilot, The Man from Glengarry, Glengarry School Days, The Prospector* and *The Doctor.* His latest novels are *Corporal Cameron of the Northwest Mounted Police,* and its sequel, *The Patrol of the Sun Dance Trail.* Other works include *The Angel and the Star* (sermons), *The Life of the Late Rev. Dr. James Robertson* and *The Dawn by Galilee.* B.M.W.

GORDON, Daniel Miner (1845-), a Canadian Presbyterian clergyman and educator, chosen in 1903 to succeed the Rev. George Monro Grant as principal of Queen's University. Dr. Gordon was born in Pictou, N. S., received his preliminary schooling at the local academy, and later attended the universities of Glasgow and Berlin. He was ordained to the Presbyterian ministry in 1866, and from that year until 1894 was successively pastor at Truro, N. S., Winnipeg and Halifax. While in Winnipeg he was honorary chaplain of the 90th Regiment, and saw active service with the fighting column under General Middleton during the Saskatchewan Rebellion in 1885.

Gordon was then, until his election to the principalship of Queen's University, professor of systematic theology in the Presbyterian College, Halifax. Under him Queen's has largely increased its material equipment and the number of students and professors. Dr. Gordon was conspicuous in promoting the union of the Presbyterian Churches in Canada, and has also labored for the union of the Presbyterian, Methodist and Congregational Churches of Canada. He was a delegate to the World's Missionary Convention at Edinburgh in 1910, and is vice-president of the Lord's Day Alliance. G.H.L.

GORDON, John Brown (1832-1904), an American soldier, statesman, lecturer on war subjects and author of *Reminiscences of the Civil War,* was born in Upson County, Ga. After his graduation from the state university in 1852, he took up the practice of law. With the outbreak of the War of Secession he organized the "Raccoon Roughs," a band of men from Raccoon Mountain, Alabama, where he had mining interests, and entered the Confederate army as captain of infantry, later being promoted to lieutenant-general. He commanded one wing of Lee's army at the famous surrender of Appomattox Court House. Gordon was elected to the United States Senate in 1873, 1879 and 1891. From 1888 to 1890 he was governor of Virginia and for many years was commander-in-chief of the United Confederate Veterans' Association. The latter part of his life was spent in lecturing.

GOR'GAS, William Crawford (1854-), the only man in the United States army who fights all the time. He does not contend against hostile regiments, but he battles with the disease-breeding insect enemies of man. Dr. Gorgas is surgeon-general in the United States army, with the rank of major-general; and to him is due almost entire credit for the excellent sanitary condition of the Panama Canal Zone (see Panama Canal).

MAJOR-GENERAL GORGAS

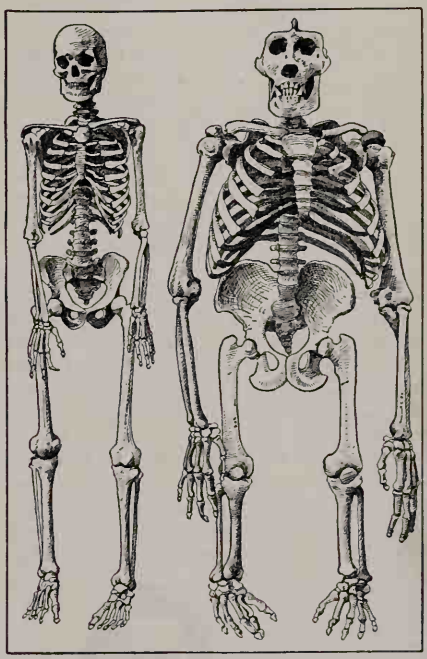
He was born at Mobile, Ala., studied at Bellevue Hospital Medical College in New York City, and in 1880 was appointed surgeon in the army. He rose through various ranks until in 1898 he was made chief sanitary officer in Havana, at the time of the occupation of Cuba by the United States army after the Spanish-American War. There he showed his exceptional ability, especially in the fight with yellow fever, applying methods which practically eliminated that disease from the island. In 1903 he was raised to the rank of colonel for his work in Havana, and in the next year he was appointed chief sanitary officer of the Panama Canal Commission.

The Canal Zone was possibly the most unhealthful and unsanitary spot in the two Americas where white men were forced to live, and Gorgas' work of improvement had to begin with fundamentals. Disease-breeding filth was cleaned up, marshes were drained, houses were screened against the infection-carrying mosquito, and within an incredibly short time the Zone was transformed from a deadly section into an area where men might live and work without danger to their health. Gorgas thus had a part in the construction of the canal comparing favorably with that taken by the great engineer, Goethals, for American engineering ability would have failed to accomplish the vast undertaking just as surely as had that of France, years before, except for the work of Gorgas and his assistant physicians and chemists.

In 1914 Gorgas was called to South Africa by the Chamber of Mines of Johannesburg, to investigate sanitary conditions in the Witwatersrand mines. He is a permanent director of the International Health Commission of the Rockefeller Foundation (which see), and has received many honorary degrees and medals.

GORGONS, *gaur'gonz,* three frightful beings of Greek mythology "whose glance was icy death," turning to stone all who looked upon them. The two older ones were immortal, but Medusa, the one best known, was mortal and met her death at the hands of Perseus. The hair of the Gorgons was a mass of serpents, their hands and teeth were of brass, and their bodies were covered with scales which could not be pierced. The name is from a Greek word meaning *grim,* and is often used to signify anything very hideous. See MEDUSA.

GORILLA, *go ril'a,* the largest of the anthropoid, or manlike, apes. The male is usually larger than a man, and stands fully six feet in height when in an upright position. The gorilla is a native of the forests of equatorial West Africa, chiefly in parts of the French Congo. A recognized authority, Prof. R. L. Garner, said, in 1916, that there were probably not more than 2,000 of them remaining in the world. Although the name is of ancient origin, practically nothing was known of these apes by white men until 1847, when Dr. Savage, a missionary in Gabun, on the west coast of Africa, sent two skulls to England. An American missionary had called the attention of naturalists to this new and strange animal a few months previously, but that there was such a beast was considered improbable. The first absolutely authentic accounts of this ape were furnished by Du Chaillu, in 1859, and



MAN AND THE GORILLA
Comparison of skeletons.

these established the fact that the gorilla did not belong to the same species as the chimpanzee, as had been previously supposed.

The gorilla is a huge, ungainly animal, with short legs and very long arms, the tips of the fingers reaching well below the knees. It is covered with a coat of coarse, matted, brownish hair. The strength of the animal is in proportion to its size, and it could with ease tear a man limb from limb. The long, canine teeth and lowering brows give an appearance of great ferocity to the male, which is belied by its somewhat timid habits.

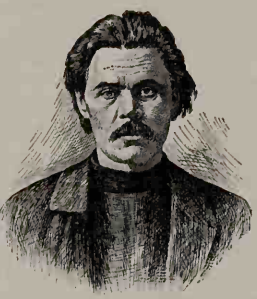
THE GORILLA
Hand and foot.

As a rule the gorilla walks on all fours, but it occasionally rises upright and walks more naturally in that position than any other of the apes. By day, gorillas roam the forests

in family parties, searching for food. At night a sleeping place is made for the females and young by lacing boughs of trees together and covering them with branches and leaves. Prof. Garner, quoted above, compliments this animal on his domestic traits. He says that when the gorilla marries he "cuts out night life, the clubs, and everything of the kind."

The food consists of fruit, nuts, honey and eggs, and though a gorilla will not kill any animal for the sake of its flesh, it will eat meat if it can get it. The chief enemy of the gorilla and the only one it fears is the leopard; all other inhabitants of the forest are terrified by its loud, hoarse challenge. It will always flee from man in great fright, but if wounded or cornered it will make a terrific fight, rending and tearing with teeth and claws. Several captured specimens have been sent to Europe and America, but even with the greatest care they can not be kept alive for more than a few months. E.D.F.

GORKY, *gor'ke,* MAXIM (1869-), famous Russian novelist, fighter for Russian liberty, fearless champion of the downtrodden and oppressed, an exile by order of the Czar, and one of the leaders of the revolutionary and socialistic forces in modern Russia. His power and ability have challenged the attention of the world.



MAXIM GORKY

Gorky's real name is ALEXIS MAXIMOVITCH PESHKOV; "Gorky," which means *bitter,* is a fictitious name which he chose at the outset of his career and which has clung to him. Indeed, "bitter" is the word which tells the story of his childhood days in his native city, Nizhni Novgorod. He was deserted by his mother, and his father died when he was four years of age—this is the history of his life's beginnings; and its utter misery, coupled with an irrepressible desire to wander, led him later to become a peddler in the streets, a gardener, cook, railroad porter and clerk. But the privations of those days gave him the opportunity to study human nature at first hand, and his own career is more varied than any of the later inventions of his vivid imagination.

His writings have attracted attention, not because of their great literary qualities, but for their social significance. He takes his readers to the haunts of thieves, paupers and lepers, and without fear or favor shows the hearts of the forlorn and fallen. His characters are rebels and outcasts with very stormy careers, but they appeal powerfully to the Russian masses. Among his best-known books are *The Story of My Childhood Days, Song of the Falcon, Foma Gordyeeff, The Outcasts* and *Three Men.* He has also written several dramas, among them *At the Depths, The Children of the Sun* and *The Barbarians;* these, as well as all his later writings, concern themselves with the political situation in modern Russia.

In February, 1915, the Czar lifted the ban which had kept Gorky out of Russia for many years. At that time the great novelist, lingering in the last stages of tuberculosis, lived on the island of Capri, where he hoped the climate would bring relief to the malady. For pathos, picturesqueness and daring struggle, the career of Gorky is perhaps unequaled among the great leaders of the twentieth century. R.D.M.

GOS'HAWK, written in medieval English as *goshauk,* meaning *goose hawk,* is a species of falcon common to Europe, Asia and the north of Africa. It is rare in Great Britain, however, particularly in England. The goshawk, so named because it was first observed to fly at geese, was found to be easily tamed, and came into use for falconing. The female, which is much larger than the male, is flown at hares, rabbits and the larger game, and the male at the smaller birds, such as partridges. The American goshawk, a larger and more attractive bird, is a menace to small poultry, and is commonly called *hen hawk,* or *chicken hawk.* See FALCON, subhead *Falconry.*

GO'SHEN, in Biblical times a district or province in Egypt, adapted to raising flocks and herds, which was assigned by Joseph to his father Jacob and family when they entered the country to escape famine in their own land (*Genesis* XLVII). It was located on the eastern border of the Nile delta, a few miles to the northwest of On, and many of the Israelites lived there up to the time they were enslaved by the Egyptians.

GOSHEN, IND., the county seat of Elkhart County, in the north-central part of the state, is twenty-eight miles southeast of South Bend, ten miles southeast of Elkhart and 110 miles

east of Chicago. It is on the Lincoln Highway, and on the Lake Shore & Michigan Southern, and the Cleveland, Cincinnati, Chicago & Saint Louis railroads. Two electric lines connect with the large cities of the state. The area exceeds four square miles. In 1910 the population was 8,514; in 1916 it was 8,955, by Federal estimate.

Goshen is an attractive residential town, well located on the Elkhart River. It is the seat of Goshen College, a Mennonite School with academic and collegiate departments, Bible, normal and summer school, and schools of business, music and oratory. The city has a Federal building, a Carnegie Library and a hospital. The industrial interests of the town include lumber mills, foundries and machine shops, and manufactories of veneering, furniture, ladders, farm implements, rubber goods and cream separators.

Goshen was settled in 1828, and received its first city charter in 1868. The waterworks and electric light plant are owned and operated by the municipality. J.B.

GOSNOLD, *gos'nuld,* Bartholomew (? - 1607), an English navigator and explorer who was instrumental in securing the grants of American charters to the London and Plymouth companies in 1606. In 1602 he explored the coast of New England from Maine to Buzzard's Bay, returning to London with a valuable cargo of furs and woods which he had secured from the Indians in trade. In 1607 he was in command of one of the three vessels which carried the first colonists to Jamestown, Virginia, and was active in the affairs of the colonies. Death by fever ended a very promising career soon after his arrival in America.

GOSPELS, the first four books of the New Testament, in which the life and teachings of Christ are described by the men whose names the books bear; that is, Matthew, Mark, Luke and John. The word *gospel,* which formerly meant *good tidings,* now means *God's story,* or the story of Christ. The first three books have much in common, as they take Christ's ministry in Galilee for their main theme and say very little concerning His divinity, while John presents Jesus as the Divine Saviour of mankind. None of the gospels aims at giving a complete biography of Christ, but each is a collection of His deeds and words for doctrinal instruction. However, Christ's betrayal, arrest, trial, crucifixion and resurrection are so important that they are described by all. Matthew and John were Apostles, so they saw all the events which they recorded, while the other two learned their facts from eyewitnesses of the scenes.

The Gospel of Matthew, written from the Jewish point of view, sets Jesus forth as the royal Messiah, who came as the fulfilment of the law and prophecy of the Old Testament to establish the true kingdom of God in the world. The author presented Christ's teachings and the miracles which He worked, as well as the useless opposition of the Pharisees, to show that God's kingdom was meant to embrace not only Jews, but all nations.

The Gospel of Mark, the shortest of the four, was written by a Gentile to the Romans, and is full of action and power. In it the author represents mainly Christ's ability to save, as shown in His miracles. Its narrative consists of a series of scenes described in the order in which they occurred, with more stress laid on the deeds than on the teachings of Christ. Ancient tradition tells us that Mark's gospel presents much of Peter's preaching concerning Christ.

The Gospel of Luke was written for Jew and Gentile alike, so it is broader than the first two, and the author was especially fond of exhibiting Christ's favor to the fallen, the outcast and the poor. This gospel presents Christ as establishing a religion to uplift and save suffering humanity. Luke says that he bases his knowledge for the book on evidence from "eyewitnesses * * * * of the word," that is, the Apostles.

The Gospel of John tells more of Christ's labors in Judea and differs greatly from the other three by proclaiming the divinity of Christ and showing that the human Jesus is the eternal Son of God. Christ's teachings and works are described to show how He brings eternal life to those who receive Him. John thus presents the mission of Jesus as the climax of God's self-revelation. See Bible; Apostles. E.C.

GOSSAMER, *gos'a mer,* written in medieval English as *gossomer* or *gosesomer,* meaning *goose-summer,* is so called because of its downy appearance and the time of its arrival. It is a light, filmy substance, consisting of the webs produced from a sticky fluid ejected with great force by small spiders, and only, according to some authorities, when they are young. On clear days, particularly in the autumn, threads of gossamer may be seen in fields of stubble, on low bushes, and floating through the air. The single strands are so delicate as

to be almost invisible, but when blown about by the wind they unite and form thicker threads. The name is also applied to a variety of gauze which is much used for ladies' veils. It is very delicate in texture, yet strong.

GOSSE, *gos,* EDMUND WILLIAM (1849-), English poet, student and critic of literature, and one of the most active of writers. He was born in London. From 1875 to 1904 he was translator to the London Board of Trade, and since 1904 has been librarian of the House of Lords. He has specialized in the study of Scandinavian literature, and has published a volume of *Studies in the Literature of Northern Europe.* Notable among other works are *From Shakespeare to Pope; An Inquiry into the Causes of the Rise of Classical Poetry in England; History of Eighteenth Century Literature,* and *History of Modern English Literature.* His poetry, which is contained in *Madrigals, Songs and Sonnets, On Viol and Flute, In Russet and Silver,* and other collections, is graceful and musical, and his prose has a distinct charm.

GOSSE, PHILIP HENRY (1810-1888), an English zoölogist, was born at Worcester. He traveled extensively in the United States, England, Canada and Jamaica to study various phases of animal life, and did much to advance the science of marine zoölogy. His influence in this direction was far-reaching and permanent. In 1856 he was made a Fellow of the Royal Society. His writings include *The Canadian Naturalist, Evenings with the Microscope* and *Marine Zoölogy.* His son, Edmund William Gosse, is the author of many popular works. See GOSSE, EDMUND WILLIAM.

GOTH'AM, a name applied somewhat derisively to New York City by Washington Irving in 1807 in his book *Salmagundi.* As early as the fourteenth century the "fools of Gotham" are mentioned in literature, the name being derived from a parish in England whose inhabitants were noted for their follies and their simplicity. According to the story, King John, on his way through the country, sent word to the Gothamites to prepare to entertain him. They pretended to be imbeciles to avoid the expense, and the king journeyed elsewhere. "As wise as the men of Gotham" after that grew into a proverb to mean *worldly wisdom.*

GOTHENBURG, *got'en burg,* or **GÖTEBORG,** next to Stockholm the largest and most important city in Sweden. It is the capital of the Län, or province, of the same name, and is a remarkably picturesque, well-built city, on a level plain about four miles from the mouth of the Göta-Elf, in the Kattegat. The chief industries are cotton spinning, sawmilling, shipbuilding and the manufacture of iron and steel. An extensive trade is conducted, the harbor, accommodating vessels drawing twenty feet of water, being rarely blocked with ice. One-fourth of the foreign commerce of Sweden passes through Gothenburg. The city has an excellent university supported by private funds, with about 2,000 students, and technical, nautical and commercial schools. Population in 1912, 173,875.

GOTHS, a powerful Germanic tribe of ancient times, which was connected in an important way with the history of the Roman Empire. In the fourth century before the Christian Era the Goths dwelt upon the shores of the Baltic Sea, but little is known of them until early in the third century A. D., when they were settled about the mouths of the Danube River. There they grew rapidly in numbers and in strength, and by the middle of the century had begun to invade the Roman province of Dacia. During many years of warfare they held their own against the Roman armies sent to drive them back, and in 272 Dacia was ceded to them by the Emperor Aurelian. About a century later they divided into the Ostrogoths (Goths of the East) and the Visigoths (Goths of the West), the former dwelling on the shores of the Black Sea, the latter inhabiting Dacia and the banks of the Danube River.

The Visigoths. In 395 a great army of Visigoths, led by the renowned King Alaric (which see), invaded Greece and laid waste the Peloponnesus. Alaric ceased his depredations only when the governorship of Illyricum was promised him. In 410 he stormed and sacked Rome, and was preparing to lead his forces to Sicily when he died. Under his successors a powerful Visigothic kingdom was established in Southern Gaul (the southern part of modern France) and Spain. In 507 Alaric II, king of the Visigoths, was defeated by the Frankish king, Clovis (which see), and the territory of the Visigoths as far south as the Pyrenees Mountains was added to the kingdom of the Franks. The Visigothic kingdom in Spain endured until 711, when the last king, Roderick, was slain in a battle with the Moors.

The Ostrogoths. In the latter part of the fifth century the Ostrogoths were given permis-

sion to settle in Pannonia, a Roman province between the Danube and the Save rivers. Theodoric, their most celebrated ruler, who became king in 476, invaded Italy in 488, and in 493 defeated and slew Odoacer, the barbarian chief who was then on the throne of Italy. Theodoric ruled the country with great vigor and ability until his death, in 526. For several years thereafter the Ostrogoths were warred upon by the armies of the Eastern emperors, and about 554, broken and scattered, they disappeared from history as a separate nation. See THEODORIC; ODOACER.

Consult Bradley's *The Story of the Goths;* Gibbon's *Decline and Fall of the Roman Empire.*

GOTTSCHALK, *got'shahlk,* LOUIS MOREAU (1829-1869), an American musician, born in New Orleans, La. He began to compose at the age of sixteen, and made successful concert tours in France, Switzerland, Spain, South America and the United States. In these he played chiefly his own compositions and conducted his orchestral works. He composed extensively for the piano, *The Last Hope* being considered his masterpiece. His works have an originality and charm which were greatly enhanced by the freshness and passion of his playing. He is remembered as a gifted performer rather than a composer.

GOUGH, *gof,* JOHN BARTHOLOMEW (1817-1886), a temperance orator of remarkable magnetism, who early in life was a drunkard, with only disreputable men for his companions. After terrific struggles he got control of himself and became America's foremost temperance worker. Gough was born in England, but his parents moved to the United States when he was a child.

After the death of his mother he gave himself to debauchery, earning a meager living by singing in saloons and concert halls. He was induced to sign a pledge, but there were many lapses. However, once master of himself, he never fell again. From that time on he devoted his energies to the lecture platform in behalf of temperance, traveling in America and England, always holding himself up as an example to all who would heed his pleas. He was the leader of the red-ribbon movement; during its vogue literally millions of people wore little red-ribbon badges as the visible token of a written pledge to abstain from alcoholic drink. He died while delivering a lecture in Frankford, Pa. He published a series of *Temperance Lectures* and *Temperance Addresses,* and a volume of sketches, *Sunlight and Shadow; or Gleanings from My Life Work.*

GOUIN, *goo aN',* SIR LOMER (1861-), a Canadian barrister and statesman, premier and attorney-general of Quebec since 1905. He was born at Grondines, Que., attended Sorel and Lévis colleges, and was graduated from Laval University in 1884. In the same year he was called to the bar, his success in his profession being immediate. He was an unsuccessful candidate for the House of Commons in 1891, but in 1897 was elected to the Quebec assembly. He became one of the leaders of the Liberals, was commissioner of public works from 1900 to 1904, and then in 1905 was called on to form a ministry. He was made a Knight Commander of the Order of Saint Michael and Saint George in 1908, and in 1910 was chosen batonnier-general of the Quebec bar, a tribute to his professional standing.

He was chairman of the Interprovincial Conference at Ottawa in 1906, and was a delegate to a similar conference in 1910. The honorary degree of LL.D. was conferred on him by Laval University in 1902, McGill University in 1911 and the University of Toronto in 1915. In the words of the chancellor of the last institution, "By common consent, by the judgment and verdict of public opinion, Sir Lomer Gouin is to-day regarded by the people of Quebec as one of the most distinguished, most capable and most praiseworthy men in Canada." G.H.L.

GOUJON, *goo zhoN',* JEAN (1520?-1572?), the most distinguished sculptor produced by France in the sixteenth century. During most of his career he worked in collaboration with the famous architects of his day, and it is in the wonderful harmony between his sculptures and the architecture which they adorned that his fame as an artist consists.

Although evidence has been offered justifying the date 1520, the time and place of Goujon's birth are still uncertain. In 1561 an attempt was made to turn out of the royal employment all those who were suspected of Huguenot (Protestant) tendencies. Goujon had always been claimed as a reformer, and it is possible that he was one of the victims of the attack. At any rate, from this time on all trace of him was lost.

Goujon worked with the architect Pierre Lescot, the celebrated architect of the Louvre, and among his famous productions are several bas-reliefs which he designed for the church of Saint Germain l'Auxerrois in Paris, and a

wonderful series of fountains near the Cemetery of the Innocents. These fountains were later removed and arranged in a public square, where they still are known as the Fountain of the Innocents. Goujon executed many carvings for the Louvre, and his most notable contribution to this wonderful structure is the Gallery of Musicians. His death is said to have taken place during the Saint Bartholomew Massacre in 1572.

GOULD, *goold,* the name of an American family which won a position of commanding influence in business and finance. Its most famous member, Jay Gould, was a remarkable railroad financier. Two of his children, George Jay Gould and Helen Miller Gould Shepard, attained special prominence, one as a business man and capitalist, the other because of her generous and noble efforts to make the world better.

Jay Gould (1836-1892) was born in Roxbury, N. Y. He received an academy education, and at the age of sixteen began work in a hardware store. Four years later he entered the tanning and lumber business, in 1857 became a bank director in the little town of Stroudsburg, Pa., and soon began to buy railroad stock. This stock he disposed of at a handsome profit after the financial panic of 1857, and with the money thus gained he purchased a controlling interest in the Rutland & Washington Railroad (between Troy, N. Y., and Rutland, Vt.), becoming its president, treasurer and general manager.

In 1859 he removed to New York, where he entered upon a career that was destined to have far-reaching effects in the history of American railroads. He began by obtaining control of the Erie Railroad when it was in financial straits, and in 1868 was elected its president. By a similar method, that of depressing the value of the stock in the open market and then buying during the period of depression, he continually added to his railroad holdings until in 1880 he controlled 10,000 miles of road, nearly one-tenth the mileage of the entire country. Among the lines which came under his control were the Union Pacific, the Missouri Pacific, the Wabash, the Texas Pacific and the Saint Louis & Northern.

The consolidation of the various competing telegraph lines into the Western Union Telegraph Company in 1881 was also due to his genius for engineering great enterprises. Probably the most spectacular of his financial moves occurred in 1869, when he and James Fisk attempted to "corner" the gold market. The result of this was the disastrous financial panic of September 24, whose place in history is known as "Black Friday" (which see). Gould's fortune, at his death, was estimated to be $72,000,000.

George Jay Gould (1864-), eldest son of Jay Gould, was born in New York City and was privately educated. At the age of twenty-one he succeeded his father as partner in the banking house of W. E. Connor & Company of New York, and three years later entered the railroad service as president of the Little Rock & Fort Smith Railway. Under his able management the Gould interests were extended until they embraced a total railroad mileage of more than 21,000, besides large holdings in other great corporations.

In 1893 he became president of the Saint Louis, Iron Mountain & Southern, of the International & Great Northern, and of the Missouri Pacific roads, and from 1892 to 1913 was at the head of the Manhattan Elevated Railway of New York City. Through his initiative the Wabash, one of the Gould lines, became a transcontinental system, with Baltimore as its Atlantic port, and he also brought about a friendly alliance between the Gould and Rockefeller interests. In 1914 he lost control of the Wabash system and his power as a railroad magnate weakened.

Helen Miller Gould Shepard (1868-), who for years devoted the greater part of the fortune left her by her father to the welfare of humanity, is the eldest daughter of Jay Gould. She became interested in philanthropic work early in life. When the Spanish-American War broke out in 1898 she gave $100,000 to the United States government for sanitary and hospital uses, and at Camp Wikoff, near Montauk Point, Long Island, personally helped in the care of sick and convalescent soldiers, besides donating $50,000 for supplies. Other notable gifts include the library building of New York University, a $10,000 donation to Rutgers College, and one of equal value to the school of engineering of New York University, and a generous contribution to the Hall of Fame (which see). She has also been deeply interested in charity work among the children of the poor. In 1913 Miss Gould married Finley J. Shepard, a prominent railway official. She is a member of the board of the Russell Sage Foundation and of the Women's International War Relief Association, and holds honorary degrees from New York

University and the American College for Girls in Turkey. B.M.W.

GOUNOD, *goo no'*, Charles François (1818-1893), a great musician, whose fame as a composer rests upon his popular opera *Faust*. He was born in Paris, studied at the Conservatoire and later in Rome, where his musical instincts seem to have been mainly ecclesiastical. In fact, for two years he studied theology with the idea of entering holy orders, but what subsequently was the Church's loss became the gain of the musical world. His *Saint Cecilia's Mass* and the two oratorios, *The Redemption* and *Mors et Vita* (Death and Life), are his most successful efforts in the domain of "religious" music. *Romeo et Juliette* almost rivaled Faust in the affections of the musical public.

GOUNOD

At the outbreak of the Franco-German War in 1870 Gounod took refuge in England, where he remained and made his home for many years. In 1871 he composed his "Biblical elegy," *Gallia*, and also many songs, by which he became popular in America; two of these were *Maid of Athens* and *There is a Green Hill far Away*.

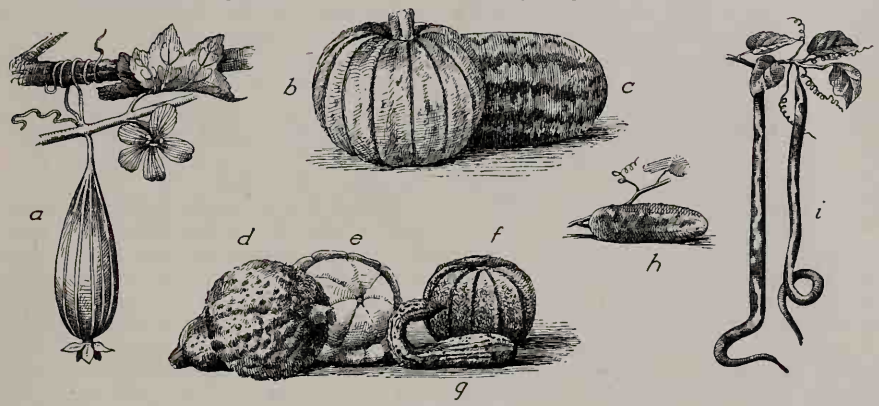
Two extracts from his private letters throw light on the composer's philosophy of life:

Friendship and music, at one and the same time, form a small part of that state of bliss which will consist in the "simultaneousness of all joys."

We are not in the world to do what we wish, but to be willing to do that which it is our duty to do.

GOURD, *gohrd*, or *goord*, a popular name for a family of ornamental trailing or climbing vines, bearing hard-shelled fruits of various shapes. In its wider sense the term also includes squashes and pumpkins, which really belong to the same family, as also do melons and cucumbers. These last differ from the typical gourds in that they are in part edible.

When a large amount of vine is desired quickly, to cover arbors, waste places or walls, gourds are very desirable. If the seed is planted in light, rich soil in a sunny location, when danger of frost is over, they are easily cultivated and require about the same care as squashes. These vines produce large, alternate leaves with pointed lobes, and blossoms which are yellow in most species and often striking and handsome. The fruits of various species appear in many shapes and markings, and may be put to a number of uses.



VARIOUS GOURDS

(*a*) Dishrag gourd; (*b*) pumpkin; (*c*) watermelon; (*d*) Hubbard squash; (*e*) mammoth white bush squash; (*f*) muskmelon; (*g*) crookneck squash; (*h*) cucumber; (*i*) snake gourds.

Varieties and Uses. The *dishcloth*, or *towel, gourd* is a species which has become prominent in America. The interior of the dried fruit is fibrous, and, when properly prepared, makes a dishcloth or bath sponge which is always sweet and clean. Very young fruits of this variety are edible.

The *bottle gourd*, also called *sugar trough*, produces bottle-shaped fruits which, when dried and emptied of seeds, are excellent for carry-

ing water, which remains cool in such a vessel. Pilgrims in the Orient used bottle gourds, and they might be called the original thermos bottles.

Another species, the *nest-egg gourd,* produces small, egg-shaped fruits, which may very well be used as nest-eggs, as the name implies.

Other species are the *dipper, pipe gourd* or *calabash, apple-shaped, orange, pear-shaped, powder horn* and *Hercules club.* All can be used as dippers, and they are ornamental and excellent as toys for children. A gourd in which the interior has dried and the seeds have loosened makes a good, natural rattle for a baby. M.S.

GOUT, *gowt,* a constitutional disorder, chiefly in the male sex, occurring in paroxysms of severe pain in the great toe, in the heel, or in the calf of the leg. It often spreads to the larger joints and the internal organs, and is usually accompanied by acute indigestion.

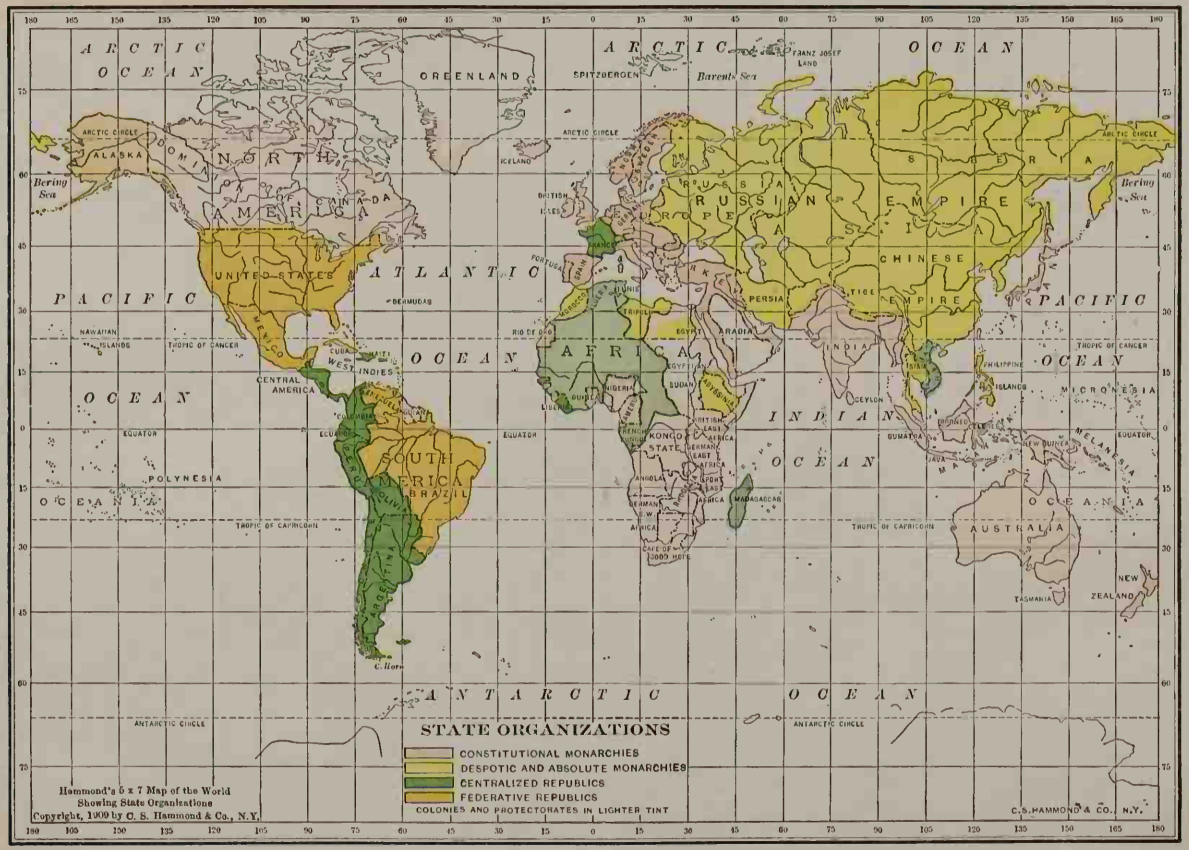
The disease is due to an excess of uric acid in the blood. Indolence, inactivity and intemperance in eating rich foods and drinking fermented liquors are the principal causes. Gout may be acquired or it may be hereditary. If the former, it rarely appears before the victim reaches the age of thirty-five; if the latter, it is frequently observed earlier. Strict regulation of the habits of life is an important factor in the treatment of gout.

GOV'ERNMENT, the political machinery by which a community or state exercises control over its public affairs; the term also popularly embraces the body of men through whom this control is exercised. Official oversight of all the public affairs of men and also of many of their more private undertakings has been necessary since people first came into contact with each other. Every man has a right to a certain degree of personal liberty. He is not to be denied this right so long as in its exercise he does not encroach upon the rights of others. One man cannot take from another any privileges he may justly claim for himself. If among inalienable rights are those of "life, liberty and the pursuit of happiness" then all men must consent to such control as will preserve the balance between right and wrong in human affairs.

The general purpose of all government is broadly stated in the preamble to the Constitution of the United States, namely, "to establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare and secure the blessing of liberty * * * ." To attain these ends a government defends the people against foreign aggression; supports courts of justice; regulates property rights of individuals, and determines the political rights and duties of citizens or subjects and the privileges of aliens.

A government assumes control of various matters directly relating to the welfare of its people which might conceivably be trusted to private enterprise. It coins money; regulates trade and commerce; maintains roads, highways and postal systems; provides sanitary regulations; enforces public education, and cares for the sick and the poor. As to the extent to which a government should control at least a few of the functions above noted, statesmen are unable to agree. Some contend that all matters should be left to individuals to the limit of their ability to manage affairs, while others, on the contrary, would have the field of governmental action greatly extended. The extreme of this latter view is represented by the theories of socialism; the socialists would have the government not merely regulate all great public business enterprises but actually own and operate most of them, such as railroads, telegraphs, express companies, and the like. The argument directly opposed to state ownership and control and representing the extreme of individual liberty is offered by nihilism and in the theories of the anarchists; both of the latter would use force to abolish all centralized authority and to substitute absolute individual freedom.

Some kind of government has existed among peoples from the earliest times, but while scientific development has been steady, there is not yet a normal or absolute type which may be pointed to as a fairly perfect model. Governments have grown, developed and changed with the advancing times; all countries are more carefully administered to-day than formerly, but no two nations employ exactly the same means to put into effect their policies. With respect to their nature, governments may be classified broadly as *autocratic* and *constitutional,* or *popular.* In the former, power is exercised without restraint by an individual or by a few selected members of the state; in the latter, comprising republics and limited monarchies, power is vested in the entire body of persons who compose the state, and these delegate immediate authority to their agents. Only constitutional governments "derive their just powers from the consent of the governed." Of autocratic governments the


STATE ORGANIZATIONS
CONSTITUTIONAL MONARCHIES
DESPOTIC AND ABSOLUTE MONARCHIES
CENTRALIZED REPUBLICS
FEDERATIVE REPUBLICS
COLONIES AND PROTECTORATES IN LIGHTER TINT
Hammond's 5 x 7 Map of the World
Showing State Organizations
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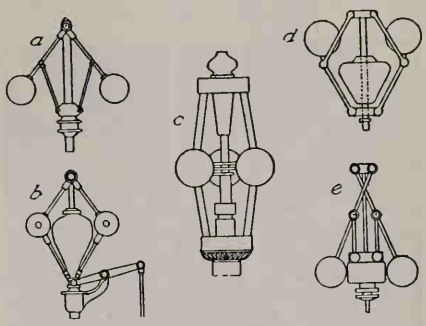
ARCTIC OCEAN
ATLANTIC OCEAN
PACIFIC OCEAN
INDIAN OCEAN
ANTARCTIC OCEAN
OCEANIA
NORTH AMERICA
SOUTH AMERICA
AFRICA
RUSSIAN EMPIRE
CHINESE EMPIRE
UNITED STATES
CENTRAL AMERICA
WEST INDIES
BRAZIL
ARGENTINA
CHILE
PERSIA
ARABIA
INDIA
SIBERIA
AUSTRALIA
NEW ZEALAND
MADAGASCAR
KONGO STATE
GREENLAND
ICELAND
SPITZBERGEN
FRANZ JOSEF LAND
Barents Sea
Bering Sea
ARCTIC CIRCLE
ANTARCTIC CIRCLE
TROPIC OF CANCER
TROPIC OF CAPRICORN
EQUATOR
ALASKA
DOMINION OF CANADA
MEXICO
CUBA
HAITI
BERMUDAS
NAWAIIAN ISLANDS
POLYNESIA
BRITISH ISLES
FRANCE
SPAIN
PORTUGAL
MOROCCO
ALGERIA
TUNIS
TRIPOLI
EGYPT
RIO DE ORO
LIBERIA
GUINEA
NIGERIA
SUDAN
ABYSSINIA
EGYPTIAN
BRITISH EAST AFRICA
GERMAN EAST AFRICA
PORT. EAST AFRICA
ANGOLA
GERMAN S.W. AFRICA
CAPE OF GOOD HOPE
CEYLON
SUMATRA
JAVA
BORNEO
ISLANDS
PHILIPPINE
MICRONESIA
NEW GUINEA
MELANESIA
TASMANIA
C. Horn

world has few modern examples; that of Turkey is the most prominent, although Russia was a pure autocracy prior to 1907. Of popular governments the early democracy of Greece is usually cited as the most striking ancient example; numerous attempts at republican institutions have been made in various countries of every era since the Greek, but the United States, Switzerland, France, Brazil, Chile and the Argentine Republic, are the only conspicuous present-day examples of important countries in which republican government appears to be successful and permanent.

The mere form and name of a government are not sufficient to place it in one or the other of the above classes. A republican form existed in Rome long after the assumption of power by the emperors, while on the other hand, most of the so-called Spanish-American republics of the present day are scarcely more than autocratic control in disguise. It may be noted also that the present régime under the king of England, known as a monarchy, is in reality controlled and managed by the people and is therefore republican in fact. The monarchical is still the prevailing world type, except on the two American continents, yet in nearly every monarchy the royal power has been partially transferred to the people by means of legislative bodies, the members of which are elected directly by the people. The present governments of the United States and Great Britain are the best types of popular control in the world to-day. They differ in many features. W.B.G.

See ARISTOCRACY; MONARCHY; REPUBLIC; also, in alphabetical order, concrete descriptions of the government of each country, state and province. At the end of the article CIVIL GOVERNMENT numerous topics of interest in this connection are indexed. The following books are recommended: Beard's *American Government and Politics;* Lefroy's *Canada's Federal System;* Bryce's *The American Commonwealth.*

GOV'ERNOR, a mechanical device for controlling the speed of steam engines and motors. The usual form consists of an upright shaft kept revolving by power supplied from the engine and supporting a pair of metal balls. If the speed of revolution becomes too great the two balls are compelled by centrifugal force to fly farther apart. By this action a valve connected with the cylinder is opened and steam is allowed to escape until the normal speed is again reached. Should the speed be too slow the balls fall closer together and automatically open a valve which admits more steam to the cylinder. Governors differ in design but the object of all is the same.



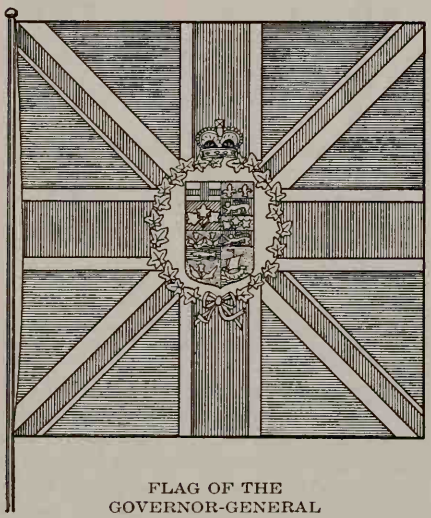
GOVERNORS

(*a*) The simplest form, called Watt's governor; (*b*) Porter's; (*c*) Pickering's; (*d*) Pröll's; (*e*) spring governor.

GOVERNOR, the chief executive of each state of the American Union, elected by the people for a term varying from one to four years. One of the duties of the governor is to report to the legislature the general condition of the state and to recommend needed legislation; he also has power to convene the legislature in special session. In nearly all states, before a bill becomes a law, it must have his signature, and if he vetoes a bill it is returned to the legislature for reconsideration. The power of pardoning criminals is generally vested in him, although a number of states have created pardoning boards which share this power with the governor. He appoints minor state officers and in some states the members of commissions and boards, but confirmation is usually required by the Senate in these cases. The state constitution requires that the governor faithfully execute the laws, and he is commander-in-chief of the state militia. Salaries of governors range from $2,500 to $12,000 per year, in the various states.

GOVERNOR-GENERAL, the personal representative of the English sovereign in Canada, and under the king the executive head of the Dominion government. In all executive functions relating to the internal interests of the provinces he acts with the Privy Council, and is bound by the advice of its members, but has the power of reserving for the consideration of the imperial government any proposed legislation which in his opinion endangers imperial interests. The Governor-General's position is therefore dual; he knows no superior other than his sovereign when royal rights are threatened, but is a servant of the Do-

minion in purely local affairs. His attitude toward Canadian political factions is that of strict neutrality. He is appointed by the English ruler, usually for a term of five years; his salary is $50,000 per annum. See CANADA, subtitle *Government*.



FLAG OF THE GOVERNOR-GENERAL

GOVERNOR'S ISLAND, a small island in the Bay of New York, near the lower end of Manhattan Island, at the entrance to East River. Originally it comprised sixty-five acres, but this area has been almost doubled by the addition of filled-in land. It is used entirely by the United States government for military purposes, and besides forts Jay, Castle, William and South Battery, for military protection of the great metropolis, contains buildings for the principal commanding officers.

GRACCHUS, *grak'us,* the name of a distinguished Roman family, of which the following were prominent members:

Tiberius Sempronius Gracchus, a Roman magistrate (born about 210 B.C.), who also served as a general in Spain and Sardinia. He married Cornelia, daughter of Scipio Africanus the Elder, and was the father of the two best-known Gracchi, to whom their mother referred as her jewels.

Tiberius Sempronius Gracchus (?160-133 B.C.), a Roman politician, served under his brother-in-law, the younger Scipio Africanus, at the siege of Carthage and was the first man to mount the walls. He was appointed quaestor in 137 B.C. in Spain and served there in the Numantine war. In 133 B.C. he was elected tribune of the people and sought to introduce land reforms to improve the condition of the poorer classes. At the end of his term he tried, contrary to the laws, to secure reëlection, and was killed in the disturbance that followed.

Caius Sempronius Gracchus (158-121 B.C.) was a quaestor in Sardinia in 126 B.C. and was afterwards elected tribune of the people. He renewed the law of his brother, and tried to substitute a democracy for the existing aristocratic form of government. He was reëlected to the tribuneship in 122 B.C., but became unpopular and failed to win the office a third time. Riots ensued, and at his own request Caius was killed by his slave. See TRIBUNE; QUAESTOR.

GRACE, DAYS OF, three days allowed in which to make payment of a note or draft after the day on which it becomes due. These days were formerly allowed as a favor, and the name arose from this fact, but the courts sanctioned the custom and it grew into law which remained in effect for many years. No days of grace are now allowed in over half of the states of the Union, except on sight drafts. Bankers' checks and notes on demand are payable without grace, and no days of grace are allowed on time paper. In the United States, when the last day of grace (in states where allowed) falls on a legal holiday or Sunday, the note is payable on the first business day thereafter, but in England and Canada on the preceding day.

GRACES, THE THREE, in Greek mythology, the daughters of Zeus and Eurynome, the three goddesses who presided over the dance, the banquet and all kindred pleasures and polite accomplishments. The English poet Spenser describes them in these words:

> These three on men all gracious gifts bestow
> Which deck the body or adorn the mind,
> To make them lovely or well-favored show;
> As comely carriage, entertainment kind,
> Sweet semblance, friendly offices that bind,
> And all the complements of courtesy;
> They teach us how to each degree and kind
> We should ourselves demean, to low, to high,
> To friends, to foes; which skill men call civility.

In the writings of the Greek poet Hesiod they are given the names of Aglaia (Brightness), Euphrosyne (Joy) and Thalia (Bloom). Homer represents them in the *Odyssey* as the attendants of Aphrodite. In art they are grouped together, usually embracing each other or clasping hands. There is a well-known painting of the Three Graces in the Louvre,

Paris, the work of a French artist, Jean Baptiste Regnault.

GRACKLE, or **GRAKLE,** *grak''l,* in America, the name applied to various kinds of blackbirds, the best known of which is the purple grackle, or crow-blackbird, common throughout the Eastern and Central United States and northwestward to Alaska. In India and in Europe the name is given to various birds of the starling family which show considerable intelligence; they readily learn to perform various amusing tricks, and can imitate the human voice.

GRADY, *gra'di,* Henry Woodfin (1851-1889), an American orator and journalist, whose splendid work as editor of the Atlanta *Constitution* from 1880 to his death was an important factor in uniting the South and the North after the War of Secession. He was born in Athens, Ga., and after being educated at the University of Georgia began his work as a journalist in a series of letters on the resources of his native state. As correspondent of various publications he attracted wide notice by his articles on building up the South, while "The New South" was his chief topic as an orator. In Atlanta the Grady Memorial Hospital was erected in appreciation of Mr. Grady's work.

GRAFT'ING. If a bud or twig from one plant be inserted in a cut made in the surface of another, of the same or a related species, in such a way that there can be a circulation of sap between the parts, the two will unite and a new growth will result. This operation, known as *grafting,* or *graftage,* is a method of propagating plants which is employed in the culture of nearly every kind of fruit tree and of numerous flowers, ornamental trees and shrubs. The portion upon which the detached shoot is inserted is called the *stock;* the transferred part is called the *cion* (or *scion*), and the new growth the *graft.* The practical value of this form of plant husbandry is unquestioned, but its full possibilities and its limitations can be learned only by direct study and experiment.

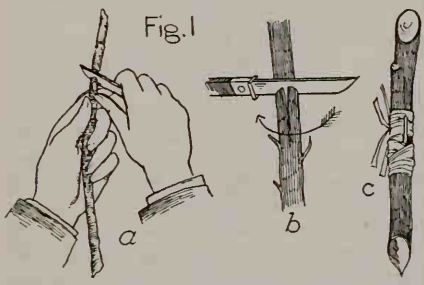
Purposes of Grafting. The fundamental object in grafting is to perpetuate a variety which does not reproduce by seeds, and which cannot be grown from cuttings with economy. The art of graftage, however, has several other distinct advantages. It is employed in many instances to increase the rate and ease of multiplying plants, for the new growths are borne upon old roots or branches, and the time necessary for producing new roots is saved. Grafting also may bring about a desired change in the character or habit of cion or stock. Such a change may be the dwarfing of a certain variety, a device sometimes employed to increase the yield of a plant, for checking growth usually promotes fruitfulness. New varieties are also developed, having characteristics of the two plants which have been united.

Again, plants are sometimes adapted to unfavorable soils by means of graftage, as in the case of certain varieties of plums, which ordinarily flourish only in heavy soils. When grafted on the peach such plums thrive in light soils, and peaches can in the same manner be made to grow in heavy soils. The fruit-grower also resorts to graftage to adapt his plants to unfavorable conditions of climate. The date of fruit-bearing is frequently advanced by inserting cions from young orchard trees into the stocks of old trees. This process is of special advantage to nurserymen who wish to test new orchard fruits. Finally, fruits are increased in size, and their flavor and keeping qualities are improved by graftage. The art is also employed successfully in modifying the colors of foliage, flowers and fruit.

General Methods. Though the methods of grafting are numerous and varied, there is one thing absolutely necessary for success, and that is to have the *cambium* layer of the cion coincide at some point with the corresponding layer of the stock. The cambium layer is the living tissue in plants, the part through which rises the sap that nourishes them. In the spring, when it is in a soft, mucilagelike condition, it readily heals and unites wounded surfaces. For this reason spring is the most favorable time for grafting most plants. However, the locality, the kind of plant, the climate and the object in view must all be taken into consideration, and no unvarying rule can be stated as to time or method of starting new growths. The wood for cions is taken when the plant is in a resting condition, preferably in the autumn after the leaves have fallen and before the time of heavy frosts. The cions are then placed in moist soil or sand, where they will be protected from freezing but not have sufficient warmth to cause the buds to swell. Sometimes, however, cuttings are taken in the spring, at or just before the time of graftage.

The three general kinds of graftage are *bud grafting, cion grafting* and *inarching.* Each of these can be subdivided into several classes, but only the standard methods in common use are discussed in the subheads below:

Bud Grafting, or *budding,* consists in applying a single bud to the cambium layer of the stock. It is a form of graftage that is employed in the culture of nearly all young fruit trees and of roses and many ornamental trees.

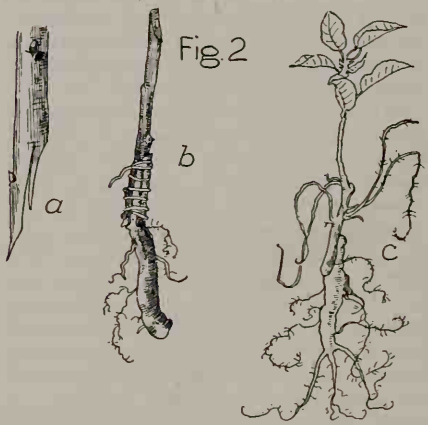


(*a*) Cutting the bud; (*b*) preparing the stock; (*c*) the bud tied.

It is performed most successfully in dry, clear weather and when the bark peels easily. The transferred part, which includes a healthy bud from a twig of the current season's growth, a portion of bark, and a bit of wood beneath the bud, is secured by placing the thumb beneath the bud and cutting a shield-shaped section out of the bark (see Fig. 1, *a*). The entire severed portion is technically known as the *bud.* A part of the stalk of each leaf is usually left on the bark to serve as a handle in inserting the bud. Some nurserymen remove the attached wood, but buds appear to thrive equally well whether the wood is cut off or retained. Two incisions are made in the bark of the stock, one vertical and one crosswise; the latter is made across the top of the vertical cut, forming a T-shaped wound (Fig. 1, *b*). The workman then inserts the bud into the cleft, pushing it down part way with the fingers and completing the operating by striking the leaf-stalk handle with the back of his knife-blade. Usually the bark has to be loosened to permit the bud to enter the cleft. Finally, the wound is closed and bound securely with a soft cord that will yield a little as the bud and bark expand (Fig. 1, *c*).

Cion Grafting, or *grafting proper,* is the insertion of a detached twig, bearing one or more buds, upon the surface of the stock. It is done in a great variety of ways, to which many special names are given. In regard to the place where the grafting is done there are four general methods—*root, crown, stem* and *top* grafting. Classification according to manner of operation gives rise to such terms as *cleft, whip, bark, saddle* and *splice* grafting. Of these methods the ones most generally used are whip grafting and cleft grafting.

Whip Grafting, also known as *tongue grafting,* is the favorite method for grafting cions on roots. The stocks are dug up in the fall and stored until January or February, when the grafting is begun. Both the stock and the cion are cut smoothly and diagonally, the cut surface being from one to two inches across. A vertical cleft is then made in each surface, so the two parts will have notches and tongues that exactly fit into each other (Fig. 2, *a*). Cion and stock are then joined, the tongue of the cion being pushed into the cleft of the stock. The joint is then securely wrapped (Fig. 2, *b*). Waxed string, or bands made by spreading melted wax over thin muslin and cutting it into narrow strips when dry, are excellent for this purpose. The grafts are packed away in sand, moss or sawdust in a cool place and left until spring, when they are planted. If the storage place is not above 40° in temperature the two parts of the graft will be found firmly knitted together by planting

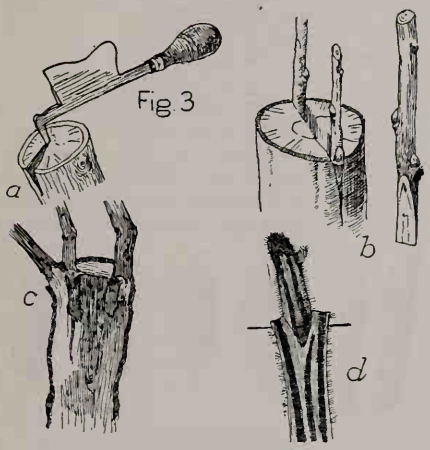


(*a*) Cion; (*b*) root graft; (*c*) growing root graft.

time, and in good condition. Grafts stored in warm, close cellars are liable to rot.

The length of cion and stock varies, but in severe climates it has been found advisable to use a cion from eight inches to a foot long and to graft it on a short root. The graft is placed in the soil in such a way that only the topmost bud is left exposed, and as the plant grows roots are sent out from the cion. The tree thus becomes "own rooted," and is thought to be hardier than one which obtains its nourishment only from the roots of a stock. Fig 2, *c,* shows a cion which has sent out roots.

Cleft Grafting is especially adapted to trees too large for whip grafting, and is the method almost universally employed for top grafting old trees. Cions for spring grafting are usually cut in late fall or winter, and stored until

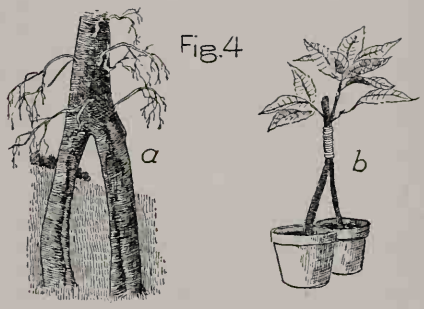


(*a*) Opening slit with grafting chisel; (*b*) cleft-graft cions inserted in stock; (*c*) vertical section of a cleft-graft a year after setting; (*d*) cleft-graft of cactus.

spring. The stock, a branch from one to one and one-half inches in diameter, is cut off squarely, forming a section with a smooth, flat end surface. This end is then split, and into the cleft is inserted a cion with a wedge-shaped base (Fig. 3; *a*, *b*). Usually the cion has three buds, the lowest one being just above the wedge-shaped section, and its sides are cut smooth and even. It is necessary to have the outer edge of the wedge a little thicker than the inner one, in order that the stock may press upon it and hold it securely at the point where the union first takes place. The end of the stock, known as the *stub*, is usually large enough for the insertion of two cions, one upon each side of the split. Not only does the double grafting increase the chance of success, but it also has the advantage of hastening the healing of the wound, which is thoroughly covered with wax to exclude air and moisture. Fig. 3, *c*, shows a vertical section of a cleft graft a year after setting. Cleft grafting is also used on cactuses, and on peonies, dahlias, hollyhocks and other thick-rooted plants. In the case of the cactus the cion is held in place with a cactus spine or pin, and bound with cord, waxing being unnecessary (Fig. 3, *d*), as the plants are very hardy and survive extreme conditions.

Other Methods. *Bark* grafting is exceedingly useful in repairing large trees whose branches have been broken off. The cions are pushed down between the bark and the wood at places where the bark is loosened for that purpose. The cions, several of which may be inserted in one stub, must be cut very thin so they will not injure the bark of the stock. They are held in place by a tight bandage, and wax is also applied, as in cleft grafting. This operation is known also as *crown* grafting. *Saddle* grafting is frequently employed in the propagation of shoots of small plants. The stock is given a wedge-shaped end, and the cion split and set upon this. The joint is then tied and waxed. *Splice* grafting is a useful method for working upon small shoots whose wood is too soft and tender for splitting. The two parts are simply cut across diagonally, laid together and secured by means of string and wax.

Inarching, or *grafting by approach,* is a process that sometimes occurs in nature without the aid of man; the union of the two oak trees shown in Fig. 4, *a* is an example of a natural graft in the forest. Inarching is the



(*a*) Natural graft of forest trees; (*b*) inarching of potted plants.

process of grafting two plants or branches, both of which are attached to their own roots. It is used to remedy defects in trees, to propagate potted plants that do not unite easily by other methods, and has been of special value in scientific fruit development. To join the parts it is necessary only to remove a portion of the bark on each plant, bring the wounded surfaces in contact, and then bind stock and cion closely together (Fig. 4, *b*).

The details of a typical process in fruit culture are about as follows: A seedling, which has been left growing long enough to bear about half a dozen leaves, is taken up with the ball of earth clinging to its roots, and transferred to a foster tree. A wound is made

in the surface of each plant by scraping off the outer bark, the two are bound together, and the graft is left to itself to complete the process. In a few weeks, when the nursling has begun to feed upon the larger plant, the soil is removed from the roots of the cion and the roots themselves are trimmed off. Later the top of the stock is also removed, and the nursling receives all of the nourishment from the vigorous roots. The resulting tree grows rapidly and bears fruit much sooner than would have been possible had it been left to nature.

The United States Department of Agriculture at Washington has carried on a long series of experiments in inarching and other forms of grafting, and the results of these investigations, which are of great interest and value, may be secured on application. B.M.W.

An excellent survey of the entire subject may be found in Bailey's *The Nursery Book*. Another simply-written book is Fuller's *Propagation of Plants*.

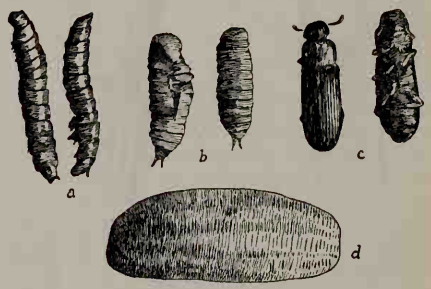
GRAHAM, *gra'am,* George Perry (1859-), a Canadian journalist and statesman, one of the most influential members of the Liberal party. He was born at Eganville, Ont., received a high school education, and at the age of twenty-one became editor of the Morrisburg *Herald,* a position he held for twelve years. He was for a brief period associate editor of the Ottawa *Free Press,* and then for fourteen years was managing director of the Brockville *Recorder.*

In the meantime he had entered public life. He was a member of the Ontario legislature from 1898 to 1907, was provincial secretary in the government of Sir George Ross in 1904 and 1905, and in 1907 was chosen to lead the Liberal opposition. He resigned six months later to accept the position of Dominion Minister of Railways and Canals in the Laurier Ministry, and was elected to the House of Commons for Brockville by acclamation. In 1911 he resigned with the Laurier government and was defeated for reëlection, but was elected for Renfrew South in a spectacular bye-election in the following year. Though Sir Wilfrid Laurier still remained the active leader of the Liberal party, much of the detail work was done by Graham, who is particularly effective as a public speaker. After the beginning of the War of the Nations he frequently addressed patriotic gatherings and recruiting meetings. G.H.L.

GRAHAM LAND, a tract of land in the Antarctic region, crossed by the Antarctic Circle, nearly south of Tierra del Fuego. It was discovered in 1832 by Biscoe, captain of an English sealing vessel, who took possession of it for Great Britain. Parts of it are known as Danco Land and King Oscar II Land, the latter section having been discovered in 1894 by a Norwegian named Larsen, who thought that he had discovered a continent. The land is icebound and mountainous. See Antarctic Lands and Seas.

GRAIL, The Holy. See Holy Grail.

GRAIN BEETLE, a stout-bodied, chestnut-brown insect, which, together with rice weevils and granary moths, costs the people of North America about $40,000,000 a year, an average of over $100,000 a day. Grain beetles appear



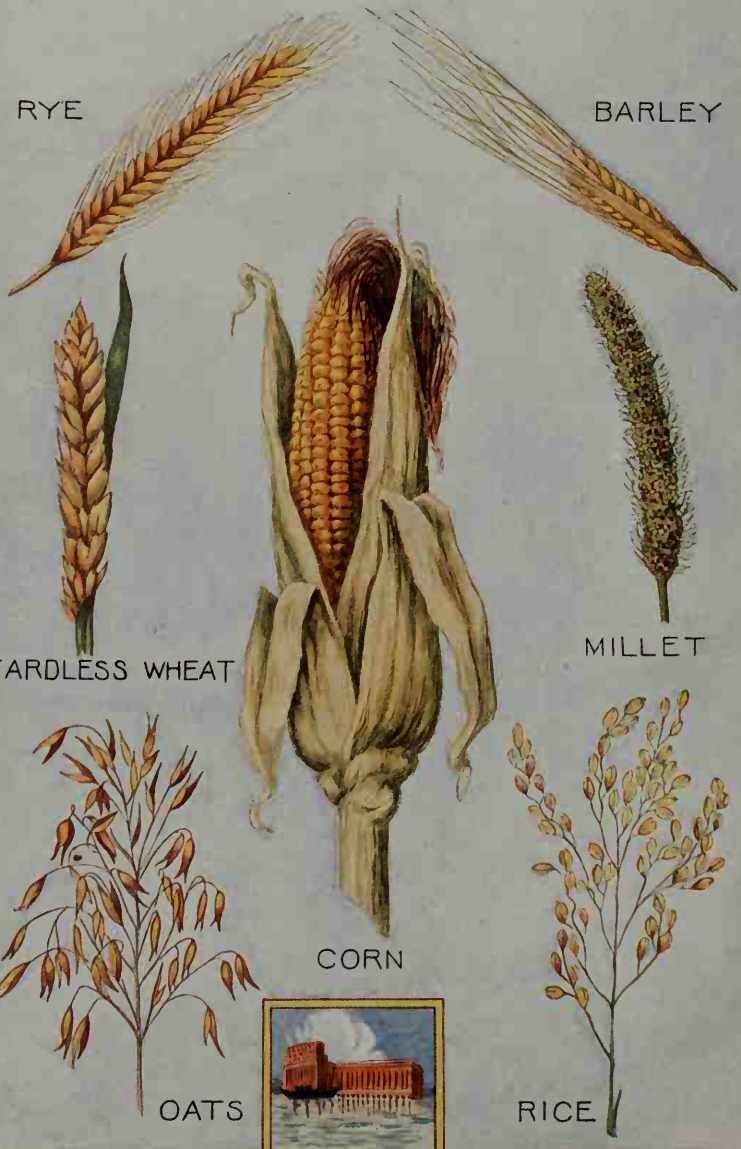
THE GRAIN BEETLE

(*a*) Larvae; (*b*) pupae; (*c*) winged insect. Figure *d* represents a grain of rice, by which figures *a, b, c* may be compared. All the figures are much enlarged.

wherever grain is stored, in every part of the world. They are a source of annoyance to manufacturers of cereals as well as to the consumer who receives a package of breakfast food in which such pests appear. They are about one-seventh of an inch long. A long, snoutlike beak extends from the head and bears the jaws and a pair of feelers (antennae). The female beetle punctures the grain with her snout and lays an egg in the hole. The egg hatches into a tiny white, footless grub, which eats into the grain. Within about forty-one days an egg produces a full-grown beetle, so eggs laid in grain yet in the field would produce beetles in the granary or mill. They in turn, multiply rapidly, especially in dark places. Machinery has been invented whereby, at small cost, grain may be subjected to the action of gases which will kill these pests and leave the grain as pure as it is possible to make foodstuffs.

GRAIN ELEVATOR. This term applies to a building equipped with machinery for loading, unloading, cleaning and storing grain, including the machinery which elevates or lifts

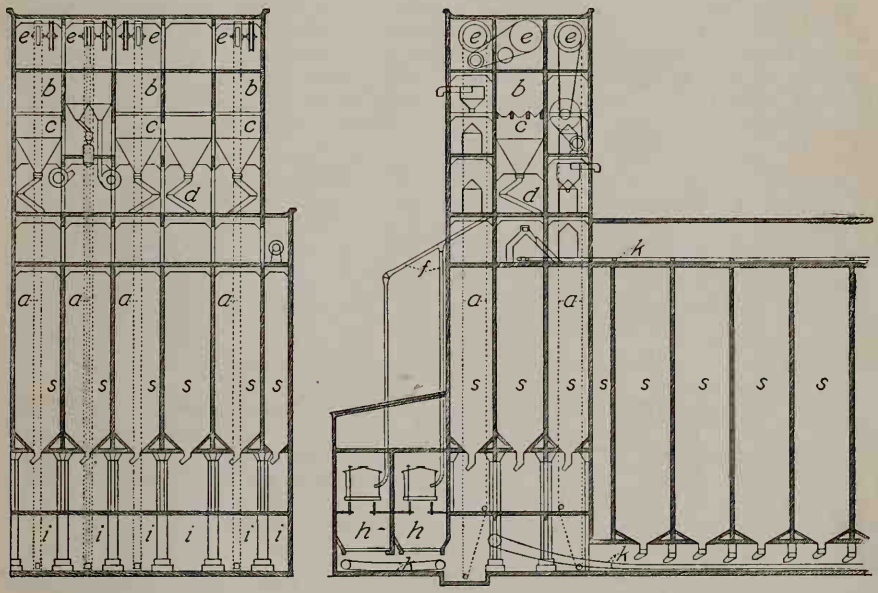
GRAINS



the grain from train or ship to the storage bins. Grain elevators, formerly made of wood, are now often of concrete construction, three stories in height. The top floor of the building, called the *cupola,* contains the loading and unloading machinery and the shafts through which the grain is distributed. The second story contains the garners and storage bins, and on the ground floor are the weighing hoppers and cleaning machinery. Railway cars are unloaded by shoveling the wheat into a pit, from which it is drawn into the elevator by means of a suction shaft, or an endless belt with buckets attached at intervals.

Elevators for unloading and loading ships are equipped with shafts, or "legs," on the dock side. The hatches of the vessel are removed, the legs are lowered into the hold, the machinery, operated by steam, gas or electric power, is set in motion and the grain is quickly drawn up into the bins. In large elevators 12,000 bushels of grain may be unloaded each hour per leg. As several legs are at work at the same time the speed of unloading is greatly increased. One of the largest elevators in the world stands alongside the docks at Superior, Wis. It has sixteen legs and can load or unload the largest grain-carrying vessel in less than four hours. Loading is simply a reversal of the operations of unloading. Hollow legs communicating with the storage bins are lowered into the hold of the vessel, the bins are opened and the grain pours into the vessel.

There are grain elevators in most English and European towns, but they are not so large nor do they handle such quantities of grain as annually pass through the elevators of Canada and the United States. The elevators of Port Arthur, Canada, as yet the largest in the world, are noted for their speedy loading and unloading of vessels, and yearly handle vastly increasing quantities of grain from Western Canada. See PORT ARTHUR. F.ST.A.



INTERIOR ARRANGEMENT OF A GRAIN ELEVATOR

(*a*) Legs; (*b*) garner; (*c*) scales; (*d*) distributing spouts; (*e*) pulleys; (*f*) car spouts; (*s*) storage bins; (*h*) receiving hoppers; (*i*) motors and other machinery; (*k*) conveyor belts. The illustration at the left is a cross section view from the front of the building; at the right, cross section view from the side.

GRAINS, the "breadstuffs" of the world, the seeds of several valuable plants of the grass family. Because Ceres, the Roman goddess of the harvest, presided especially over the growth of the grains, they are commonly known as *cereals.* Since bread is more widely used by civilized man than any other food, the raising of grain constitutes one of the greatest industries in the world. There are six kinds of grain of chief importance; these are wheat, rice, corn, oats, barley and rye, and each has its own

requirements and habits of growth so that it grows best in certain climates and locations. But each grain, wherever it grows in great profusion, is likely to constitute the chief food of the mass of people. Time was, before the world was made comparatively small by railroads and steamship lines, when the people of a wheat-growing region had no rice, and the people of a rice-growing region scarcely knew what corn looked like; and while to-day such conditions have been done away with, the lines of demarcation are still in most cases rather clearly drawn.

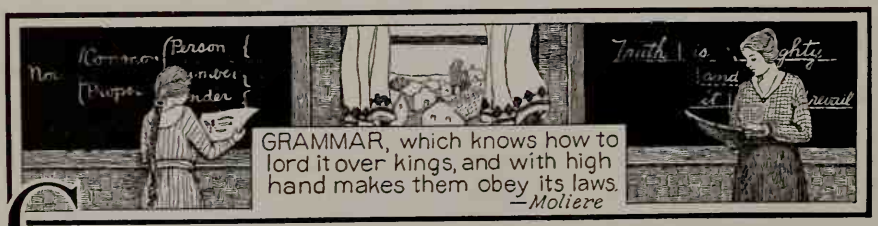
Thus in the United States and Canada, whose wheat-growing possibilities are not surpassed elsewhere in the world, wheat is the staple breadstuff; while in China where wheat cannot be grown easily and cheaply, but where rice thrives in the watery fields, the people subsist almost entirely on rice. Asia might be called the "rice continent," just as America is the "corn and wheat continent," and since the rice regions are those which have been most thickly settled, statistics show that rice forms the chief food of more people than any other grain. Wheat is generally conceded, however, to be the most satisfactory bread material, though some nationalities of Europe use barley or oats or rye, and in the southern parts of the United States Indian corn is a favorite breadstuff. The very name "bread" means different things, according to the country in which it is used. In the Orient it would mean rice cakes; in Germany or Russia, rye bread; in Norway, barley loaves; in Scotland, oaten cakes; in Georgia or Texas, corn "pones," and in England, Canada and most parts of the United States, wheat bread made with yeast.

Under their proper titles in these volumes the various grains are fully treated, and many interesting points are there brought out—what each grain demands for successful growth, where each is most lavishly produced, and what is the relative value of each in the world's crops. These articles also give the food value of the various grains, but for ready reference a comparative table is added here:

Chemical Composition of Grains

GRAIN	WATER	PROTEIN	FAT	TOTAL CARBOHYDRATES	REFUSE AND ASH	FUEL VALUE PER POUND
	Per cent	Per cent	Per cent	Per cent	Per cent	Calories
Barley	11.5	8.5	1.1	77.8	1.1	1,650
Corn	10.3	7.5	4.2	65.9	12.1	1,545
Oats	7.3	16.1	7.2	67.5	1.9	1,860
Rice	12.3	8.0	.3	79.0	.4	1,630
Rye	12.9	6.8	.9	78.7	.7	1,630
Wheat	11.4	13.8	1.9	71.9	1.0	1,675

GRAM, in the metric system of weights and measures, is a measure of weight which is equal in mass to one-thousandth part of a kilogram. A gram is equal to 15.432+ grains, Troy weight, and its weight is the same as that of a cubic centimeter of distilled water at its greatest density, or when it is at the temperature of 39.2° F. The gram is used in weighing light articles and in compounding medicines. See METRIC SYSTEM, for comparative tables of all weights.



GRAMMAR. Every language, in the course of its history, has had many different grammars. The grammar of a language is not a body of dead, dry-as-dust rules; it is the living system of its everyday usages, the customs established by those who are speaking the language. Therefore, since usage is not fixed but is perpetually changing, grammar necessarily changes with it. Shakespeare was not ungrammatical in writing, "This was the

most unkindest cut of all," because in his day the double superlative was still used by the best writers and speakers; but modern grammar brands such expressions as incorrect, reasoning that if the ending *est* conveys the superlative idea, the superlative adverb *most* is not needed. The simplifying spirit of the English tongue has constantly been discarding the superfluous.

English grammar may therefore be defined as the science which teaches the principles of correct English in speaking and writing, according to the standard of the educated people of the time. This covers not only the classes, forms and uses of individual words, but the relations in which they stand to one another when joined in sentences to express thought. The word *grammar* comes from the Greek *gramma,* meaning *letter* or *writing.*

Why We Study Grammar. The chief reason for studying grammar is, therefore, to secure a mastery of "this universal English" of ours, the language spoken by over one hundred fifty million people. In the lower grades, instruction in English takes the form of "language lessons," which merely emphasize what is correct and correct what is wrong, without teaching a system of rules; for grammar is a science, and the minds of little children are as yet too undeveloped to grasp scientific principles. Says Samuel Thurber, an authority on the teaching of English: "The language should be well possessed before it is subjected to scientific study. The youth should not be troubled with grammatical technique till he knows enough to perceive its desirableness." It is not until the seventh grade is reached that the best schools now think it profitable to introduce the study of technical grammar into the course of study.

Up to this time the pupil has been taught to use certain expressions and avoid others without always knowing exactly why. When he comes to the study of formal grammar, he learns the logical reasons for these things. As Dryden says:

> Who climbs the grammar-tree distinctly knows
> Where noun, and verb, and participle grows.

New light is thrown on the work in language, and this developing insight stimulates fresh interest. No longer must the student choose between right and wrong forms on the strength of a memorized model; instead, he applies his knowledge of fundamental rules to straighten out any problem of expression that may arise to puzzle him.

He begins to take real pride in speaking grammatically. The charm of good English begins to make its appeal. He begins to realize that correct speech means the power to express himself clearly and forcefully and will stamp him as a person of education and culture. Gradually he develops the habit of close observation and critical examination, not only of his own speech and that of those about him, but of the English used in the books and magazines he reads. The illustrations in his grammar text—quotations from the masters of modern English—furnish him with the best possible models of sentence structure, raise his standards and arouse his interest in good literature. Incidentally, they give him a certain acquaintance with these writers which makes them seem like old friends when he comes to read their works.

The study of grammar, besides teaching purity of speech and preparing the student for the appreciative study of literature, gives valuable mental training by strengthening the reasoning powers. One must think logically in order to analyze sentences and apply general rules to specific cases, just as one must think logically to analyze and solve problems in arithmetic. This is why grammar ranks second only to mathematics as a "mental discipline" study. Yet it need never be irksome, for a really enthusiastic teacher can make it one of the most fascinating subjects in the course.

Again, both language work and grammar are by their very nature closely correlated with composition, since the student must from the beginning build sentences to illustrate the principles he has been studying. Grammar is likewise a foundation for the study of rhetoric, which is but the science of grammar carried forward into an art. As the Romans used to say, "Grammar speaks; rhetoric gives coloring to speech."

Divisions of the Subject. The majority of modern grammarians recognize only two main divisions of the science—*etymology,* which has been called the "grammar of words," and *syntax,* called the "grammar of sentences." The older textbooks included three others—*orthography,* or spelling; *phonetics,* or pronunciation; *prosody,* or versification—but these are now usually studied as independent branches not properly belonging to grammar.

In the wider use of the word, grammar is *didactic, historical* or *comparative,* according to its treatment. The grammar of our schoolbooks is termed didactic because it lays down

the rules which govern current usage. Historical grammar concerns itself with one language but not with one age, for it deals with all the recorded grammars of the language. Comparative grammar finds resemblances and differences among the various languages belonging to the same general family. Historical and comparative grammar are young sciences which came into being in the nineteenth century with the interest in Sanskrit, the ancient parent from which modern languages have sprung. The present article, of course, covers only the didactic grammar of the English language of to-day.

Parts of Speech. The "grammar of words," or *etymology,* is learned through the mastery of the eight groups into which all words have been divided. These classes are called the *parts of speech,* and comprise noun, pronoun, adjective (including the articles), adverb, verb, preposition, conjunction and interjection. In these volumes each is treated individually and should be looked for under its proper head.

In studying the parts of speech and learning the inflections and uses of each, the student finds it is not a case of "once a verb, always a verb," but that words are one part of speech or another solely according to the part they play in the sentence. The same word may serve in a number of capacities—verbs as nouns; nouns as verbs and adjectives; pronouns as nouns, adjectives and even verbs. Thus, in Whittier's line, "The good is always beautiful, the beautiful is good," both *good* and *beautiful* are used once as noun and once as adjective.

Sentence-Building. *Syntax,* or the "grammar of sentences," has two divisions—*analysis,* which means taking a sentence apart into the elements of which it is composed, and *synthesis,* which means putting together words, phrases and clauses to form a sentence. The sentence is the foundation or unit of all speech, and in English the vital factor in sentence-making is the position or order of the words. In Latin, position is of no grammatical importance; words may be shifted about so as to make harmonious combinations, because it is their inflections that show in what relations the words stand to one another. In the English sentence, on the other hand, although there is a certain amount of freedom in arrangement, a change from the established order usually changes the meaning. For instance, if we transpose subject and object in the sentence, "Wellington defeated Napoleon,"

Outline on Grammar

I. Definition

(1) Deals with classes, forms, uses and relations of words
(2) Science of current usages
(3) Derivation of words

II. Purposes

(1) To teach principles of correct speech
(2) To develop keen observation and criticism of language
(3) To lead up to composition, rhetoric and the study of literature
(4) To cultivate the mind

III. Classification

(1) Ordinary use of term
  (a) Etymology, the "grammar of words"
  (b) Syntax, the "grammar of sentences"
  (c) Orthography, phonetics and prosody no longer included
(2) Broader interpretation
  (a) Didactic
  (b) Historical
  (c) Comparative

IV. Etymology

(1) Parts of speech
  (a) Noun
  (b) Verb
  (c) Pronoun
  (d) Adjective
  (e) Adverb
  (f) Conjunction
  (g) Preposition
  (h) Interjection
(2) Parts of speech a matter of function
(3) Inflections
  (a) Declension
  (b) Conjugation

V. Syntax

(1) Analysis
  (a) Parsing
(2) Synthesis
  (a) Relation to composition
(3) Order of elements of sentence
  (a) Importance in English because of lack of inflections
(4) Kinds of sentences
  (a) Declarative
  (b) Interrogative
  (c) Imperative
  (d) Complex and compound

VI. Present-Day Tendencies

(1) The trend toward simplicity
(2) Dropping gender distinctions
(3) Less frequent use of subjunctives
(4) Short sentences in favor

making it read "Napoleon defeated Wellington," or "Wellington Napoleon defeated," we either change the meaning entirely or leave it a matter of doubt. The study of syntax is therefore essential to teach the relations of words and their proper order for the clear expression of thought.

Beginning with a model of a simple declarative sentence, the student of grammar learns to separate it, first, into its essential subject and essential predicate, and then to analyze in further detail, indicating the object or the complement of the verb, and the various modifiers of subject and predicate. Following the same grammatical principles on which such a sentence was constructed, the student then builds sentences of his own. The next step is the mastery of simple interrogative and imperative sentences—learning the special arrangement and forms that are used to ask questions or give commands. From this point he proceeds to a study of the order which is to be observed in complex and compound sentences, declarative, interrogative and imperative.

Modern Tendencies. The grammar of our language is always tending in the direction of greater simplicity—fewer distinctions and more liberal application of grammatical rules in everyday speech, so as to give greater freedom to colloquial language. "A grammarless tongue," English is often called, and so it seems when compared with German, Latin and the various Romance languages founded upon Latin; for these are all less advanced than English and consequently far more complicated in their grammar.

As explained in the article on gender, distinctive forms for the feminine gender are being employed less and less. The subjunctive mode has almost disappeared from use except in a few common constructions. The long, involved sentences which characterized the older writers have gone out of style, giving way to a large extent to short, crisp sentences, easy to construct and easy to comprehend. It is small wonder, then, in view of its marvelous flexibility and the unequaled simplicity of its grammar, that English is to-day more widely spoken than any other language of a civilized race. L.M.B.

Textbooks on grammar may be secured from any of the schoolbook publishing houses. Consult Tucker's *Introduction to the Natural History of Language.*

Related Subjects. The above article aims to give merely a general treatment of the subject, but the following articles in these volumes give specific information on all the more important phases of grammar:

Adjective	Mode
Adverb	Noun
Article	Parsing
Case	Participle
Climax	Parts of Speech
Comparison	Person
Conjugation	Preposition
Conjunction	Pronoun
Declension	Punctuation
Etymology	Quotation Marks
Gender	Sentence
Infinitive	Syntax
Inflection	Tense
Interjection	Verb

GRAM'PIAN HILLS, a mountain mass in Scotland, extending across the country from southwest to northeast, south of the Caledonian Canal, forming a natural barrier between the Scottish Lowlands and the Highlands. The system, which does not consist of one range, but a series of spurs, covers portions of the shires of Dumbarton, Argyll, Stirling, Perth, Forfar, Kincardine, Aberdeen, Banff and Inverness. The highest peaks are Ben Nevis, the loftiest in the British Isles, 4,406 feet; Ben Macdhui, 4,296 feet; Ben Lomond, Cairngorm and Cairntoul. The hills are crossed by three railways and contain many passes affording views of some of the most romantic scenery in Scotland. From the northern slopes flow the rivers Findhorn, Dee, Don and Spey, and to the southward are the Forth, Tay and Esk, with numerous tributaries. In some parts of the mountains are large deer forests, where the game is carefully preserved for the sport of deerstalking. The mountains are largely of granite formation, and great quantities of the stone are quarried for building purposes. The name *Grampians* is derived from a misreading of Mons Graupius, where the Caledonians were defeated by Agricola in A. D. 84.

GRAM'PUS, a species of dolphin having a spindle-shaped body. Its color is slaty-gray, streaked with white. Several varieties are found in the northern ocean and in the Mediterranean Sea. The common grampus, or cowfish, is sometimes twenty feet long, is slow in its movements and peaceful in its habits. The name is loosely applied to almost any marine animal too large to be called a porpoise and too small to be termed a whale.

GRANADA, *gra nah' da,* formerly a Moorish kingdom in Spain, but now divided into the three modern provinces of Granada, Almeria and Malaga. Its area is 11,128 square miles, which makes it slightly smaller than Maryland

or half the size of Nova Scotia. It is traversed by the Sierra Nevada Mountains, and has fertile plains which are mainly watered by the River Jenil, a tributary of the Guadalquivir. Its principal agricultural products are

LOCATION MAP

The black space in small corner map shows the portion of the entire country that is occupied by Granada.

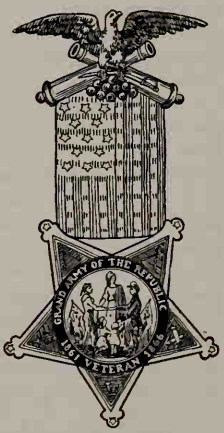
wine and oil; fruit is also abundant. Its mineral resources are lead, zinc, silver, iron and coal. There are some manufactures of textiles and bricks, and a few oil and flour mills. A railroad connects Almeria with Malaga and Madrid. The region was conquered by the Saracens in 811. In 1238 the Moorish kingdom of Granada was established, but the long Spanish war of Ferdinand and Isabella brought it to an end in 1492 with the capture of Granada. Population in 1910, 503,898.

Granada, a picturesque city whose crooked, narrow streets and quaint houses of Oriental architecture are surmounted by the towers of the Alhambra, an ancient palace of the Moorish kings. It is divided into two parts by the little River Darro, and lies amidst terraced hills covered with luxuriant vegetation, in the northern part of the province of Granada. Although now a "living ruin," it is still filled with remarkable beauty and distinction, for the gilded cupolas rising above each other give an imposing effect to the Moorish architecture. The principal buildings, outside of the Alhambra, are the Generalife, the old royal Moorish summer palace, and the cathedral, richly decorated with marble and statues. In the Royal Chapel of this cathedral are the tombs of Ferdinand and Isabella, who conquered the independent province of Granada in 1492 after a ten years' struggle, and drove the Moors from their last European stronghold.

The city, founded by the Moors in the eighth century, reached the height of its power in the thirteenth century, when it became a renowned center of wealth and learning. During this period its population was over 400,000, but, after surrendering to Spanish rule, the city slowly declined. In 1570 Philip II ordered the remaining Moors deported to inland provinces, and forty years later his successor drove them out of Spain. Although there is a modern section of the city, with a university, founded in 1531, a normal school and a school of fine arts, most of the older part of the city is in a state of decay, and the population is less than 76,000. See ALHAMBRA; MOORS.

GRAN'BY, a town in Shefford County, Quebec, situated in the southern part of the province, on the Tamaska River, fifty-five miles southeast of Montreal and thirty miles north of the United States boundary line. Transportation is provided by the Central Vermont Railroad; an electric line was in course of construction to Montreal in 1916. Granby has a $16,000 postoffice, two colleges, an academy, a convent and a park (twenty acres). The manufacture of rubber goods is the leading industry, more than 700 people being employed in the various plants. Other establishments make tobacco products (these employ 500 people), cigar boxes, rattan goods, furniture, carriages and machinery. Granby was settled in 1800 and was named in honor of Lord Granby, the commander of the British army in the Seven Years' War. It was incorporated as a town in 1855. The population, chiefly French, was 4,750 in 1911; in 1916, estimated by the Census Bureau, 5,000. J.A.T.

GRAND ARMY OF THE REPUBLIC, a patriotic American society whose membership, composed of Northern veteran soldiers, is gradually decreasing as the War of Secession, which was responsible for its founding, recedes into history. It was organized on April 6, 1866, a year after the close of the war, at Decatur, Ill. The purpose of its founders was to strengthen the ties that bound into fellowship the soldiers and sailors who fought to preserve the Union. They sought also to perpetuate the memory of those who sacrificed their lives for the cause, and to give to those who had been left in need by the death of their protectors.



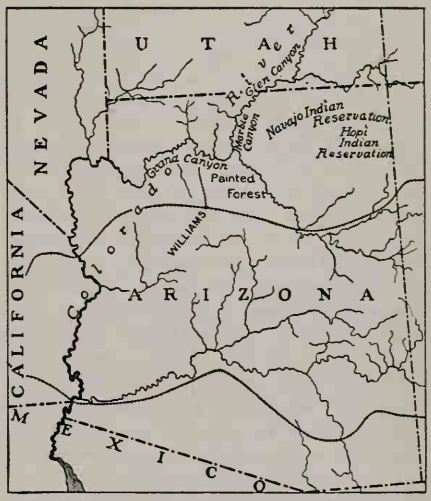
BADGE OF THE G. A. R.

Any soldier or sailor of the United States army, navy or marine corps, who served between April 12, 1861, and April 9, 1865, and was honorably discharged, and members of state regiments who were subject to orders of United States officers, were admitted as members of the society, which grew in numbers until 1890, when the maximum membership of 409,489 was reached. In that year 5,476 veterans died, and the steadily increasing death rate had reduced the membership to fewer than 135,000 at the beginning of 1917.

The Grand Army is divided into local posts and departments representing the states, and annual meetings, known as encampments, are held in the various large cities of the country. On official occasions members wear a dark blue uniform and a slouch hat. Though the Grand Army is in no sense a political organization, it has had a noticeable influence on pension legislation. The society has been especially active in charitable work and in founding soldiers' homes, and to its influence is partly due the custom of observing Decoration Day (which see). The Woman's Relief Corps (which see) is an auxiliary of the Grand Army.

GRAND BANKS, the chief source of the wealth of Newfoundland, are submerged banks of sand, gravel and fragments of rock, stretching 200 miles along the coast of Newfoundland and extending southeast into the Atlantic Ocean for a distance of 500 miles. Their waters range in depth from fifty to 1,000 feet. Thousands of sea birds, circling above them, indicate to the fisherman the location of the shallow waters teeming with fish; codfish, especially, are caught in enormous quantities (see Cod). Over 100,000 Canadian and American fishermen, in *bankers,* crafts especially equipped for fishing in these waters, brave the storms, floating icebergs and dense fogs of the Banks. The heavy fogs are due to the meeting of the Labrador currents and the Gulf Stream. Most of Newfoundland's fishery products, which in 1914 were valued at $7,971,355, are caught on the Grand Banks. See Fish, subtitle *Deep-Sea Fisheries.*

GRAND CAN'YON OF THE COLORADO, one of the greatest scenic marvels in the world. Some discerning travelers under the spell of its splendor do not hesitate to say that it dwarfs all other natural spectacles; E. Burton Holmes, who has probably traveled more extensively than has any other person, calls it "the biggest beautiful thing in the world." Simply stated, this "divine abyss" is the chasm which the Colorado River has cut for itself through the plateau region of Northwestern Arizona (see Colorado River), and is 217½ miles in length. The words *canyon* or *chasm* or *gorge,* all of which are applied to it, give a mental picture of a steep-sided, narrow valley,



LOCATION OF THE GRAND CANYON

on the more or less level floor of which a river flows; but the Grand Canyon admits of no such classification. It is from one to eighteen miles wide, and over a mile deep, and the sandy, turbulent river which twists and winds through its depths is thus buried so far below that scarcely a murmur from it reaches upward to the rim.

To try to describe the Grand Canyon is to attempt the impossible. "When the Creator made it," says one writer, "He made no adjectives to go with it." Even the faintest idea of its stupendous size, its wealth of coloring and its riot of forms, majestic, grotesque or beautiful, can be gained only from actual sight of it. The way to it is from the south, over a level, heavily-wooded plateau, and no hint of the waiting wonders comes to the visitor until he stands upon the southern rim. Across from him, miles distant, but seeming close at hand in the clear atmosphere, is the farther rim, as straight and level as the horizon, while in between and on all hands stretch craggy peaks, flat-topped mesas, steep valleys, terraced rocks, all glowing with the deepest, richest colors. Red, yellow, purple, white, brown and black blend in some spots, and in

others give place to sharply individual tones, the whole presenting a kaleidoscopic effect which no artist can hope to equal, and no writer can hope to describe it.

As for the rock formations—this "sublime city of nature's buildings"—one geologist writes of them:

"If any one of these stupendous creations had been planted upon the plains of Central Europe, it would have influenced modern art as profoundly as Fujiyama has influenced the decorative art of Japan. Yet here are hundreds of them swallowed up in the confusion of multitude."

Curiously like Oriental temples these structures look, with their rich color and their carved lines, and many of them have been christened with this resemblance in mind. There is a Temple of Buddha, a Temple of Isis and a Temple of Zoroaster.

The visitor need not content himself with viewing the canyon from the rim, for two trails, the Hermit and the Bright Angel, give access to the depths. Every turn in their winding discloses new views, and every hour in the day develops its own special beauties of light and shade. To the very bed of the river these trails lead, and the visitor may in four hours reach the depth which it has taken the river countless ages to attain. The visitor who has stayed near the canyon long enough to recover from his first wordless amazement and to form a real impression is likely to speak of it thereafter either in carefully-tempered words or in terms so glowing that to the uninitiated they seem overdrawn. One writer of this latter tendency has been more successful than many others in summing up the true spirit of the canyon:

A labyrinth of huge architectural forms, endlessly varied in design, fretted with ornamental devices, festooned with lacelike webs formed of talus from the upper cliffs, and painted with every color known to the palette in pure transparent tones of marvelous delicacy. Never was picture more harmonious, never flower more exquisitely beautiful. It flashes instant communication of all that architecture and painting and music for a thousand years have striven to express. It is the soul of Michelangelo and of Beethoven. A.MC C.

Consult Dellenbaugh's *A Canyon Voyage;* James's *In and Around the Grand Canyon.*

GRAND FALLS, the county town of Victoria County, New Brunswick, situated in the northwestern part of the province, three miles east of the Maine boundary line and at the head of navigation on the Saint John River, 202 miles from its mouth. Edmundston is thirty-eight miles northwest, and Woodstock is seventy-five miles south. The Canadian Pacific and the National Transcontinental railways serve the town. An abundance of lumber and pulpwood is found in the vicinity, and the industries of the city are largely dependent upon these resources. The beautiful scenery, delightful climate and fine facilities for shooting and hunting have made Grand Falls a favorite pleasure resort. The town was named for the picturesque falls, estimated at 100 feet, which occur in the river at this point; a fine view of the falls may be had from the suspension bridge which spans the river. French, Irish, Scotch and English comprise the greater part of the population. In 1911 it was 1,280; in 1916, estimated, 1,500. D.J.C.

GRANDFATHER'S CLAUSE, The. The fifteenth Amendment to the Constitution of the United States, adopted in 1870, conferred the right to vote upon the recently-emancipated slaves, the vast majority of whom were not fitted for this important duty. After some years of experience, many of the former slaveholding states adopted amendments to their state constitutions enabling them virtually to annul or greatly abridge the provisions of this amendment.

Such amendments provided for a strict registration, with educational tests, such as ability to read and explain any article in the Constitution. That the right of suffrage might be taken from illiterate negroes but not from illiterate white men at the same time, some states provided that the test of illiteracy should not apply to those who had descended from or were the descendants of those who had enlisted as soldiers in any war. This of course only included whites; illiterate negroes would have to pass the educational test, and very few of them could do so. In a few instances it was provided that those entitled to registration should be only those whose ancestors had the right to vote in 1867. All such clauses have received the general name of "grandfather's clause."

GRAND FORKS, a city in the Kettle Valley, British Columbia, in the extreme southern part of the province, about three miles north of the United States boundary. It is at the junction of the forks of the Kettle River, and is on the Canadian Pacific, the Great Northern and the Kettle Valley railways, 418 miles east of Vancouver, ninety-five miles west of Nelson by rail, and twenty-five miles, directly, west of Rossland. Grand Forks is an important railway center, having the roundhouses and machine shops of the Kettle Valley and Cana-

dian Pacific railways. It has the Granby Smelter, the largest copper smelter in the British Empire, and also has iron works, sawmills, nurseries and other establishments. The $60,000 Dominion building and the $40,000 provincial building are conspicuous structures. Kettle Valley, besides minerals and timber, is noted for its rich, loamy soil, and produces fruits, vegetables and grains. Population, in 1911, 1,577; in 1916, about 2,000.

GRAND FORKS, N. D., the second largest city of the state, ranking next to Fargo, and the county seat of Grand Forks County, situated on the eastern border of the state, at the point where the waters of the Red Lake River meet those of the Red River of the North. Fargo is eighty miles south, and Winnipeg, Man., is 163 miles north. The Great Northern and the Northern Pacific railways serve the city, and steamboats ply between this point and Winnipeg. The population, which increased from 12,478 in 1910 to 15,837 in 1916, is largely American, with Scandinavians predominating in the foreign element. Grand Forks was settled in 1871 and incorporated in 1881. It received its name from its location on the forks of the Red and Red Lake rivers. The area of the city exceeds three and one-half square miles.

The Red River Valley, in which Grand Forks is situated, is rich in timber and grain. It is the natural distributing point for North Dakota and Montana, and it manufactures flour, lumber, steam boilers, foundry products and bricks, the annual output of its products amounting to $3,251,075. The shops and division headquarters of the Great Northern and the Northern Pacific railways are here. The trade in live stock, wheat, oats and potatoes is extensive. Grand Forks is the seat of the University of North Dakota, opened in 1884, and of the Grand Forks College, Wesley College and Saint Bernard's Academy. The city has a $185,000 Federal building, a $225,000 courthouse and a Carnegie Library. C.W.G.

GRAND ISLAND, NEB., a distributing point of importance in its territory, and the county seat of Hall County. It is situated southeast of the geographical center of the state and on the Platte River, eighty-five miles west of Lincoln and 127 miles south and west of Omaha. The Union Pacific and Saint Joseph & Grand Island railways and the Burlington Route serve the city. Grand Island was settled in 1857 and was incorporated in 1872. In 1910 the population was 10,326; it had increased to 12,826 in 1916, according to a Federal estimate.

Through its fine shipping facilities the city has become the trade center for a large section in the northwestern part of the state. It has large wholesale houses and transacts an extensive business in live stock, grain and manufactured articles. Beet sugar, candy, canned goods, windmills, brooms and cement block are the leading products. Some of the large machine shops of the Union Pacific Railway are located here. Grand Island has the state soldiers' and sailors' home, Saint Francis Hospital, Grand Island College (Baptist), opened in 1892, and a Carnegie Library.

GRAND JURY. See JURY AND TRIAL BY JURY.

GRAND' MÈRE, *graN mair'*, a town in Champlain County, Quebec, on the right or west bank of the Saint Maurice River, which empties into the Saint Lawrence at the town of Three Rivers, twenty-one miles south of Grand' Mère. Like the neighboring town of Shawenegan Falls, Grand' Mère is a manufacturing center for pulp, paper, doors, sashes and other products of the lumber which is floated down the Saint Maurice. Shirts, boots and stoves are other manufactures. A high school for boys and a Roman Catholic convent are important institutions. Population in 1911, 4,783; in 1916, about 6,000.

GRAND-PRÉ, *grahN pray'*, a beautiful village in Kings County, Nova Scotia, on the Basin of Minas, fifteen miles from Windsor. The French settlers there were expelled in 1713, by order of the English, at the close of what is known as Queen Anne's War (see FRENCH AND INDIAN WARS). It is of this incident that Longfellow tells in his *Evangeline*, though not with historical accuracy. Grand-Pré is immortalized in the following lines:

This is the forest primeval; but where are the hearts that beneath it
Leaped like the roe, when he hears in the woodland the voice of the huntsman?
Where is the thatch-roofed village, the home of Acadian farmers,—
Men whose lives glided on like rivers that water the woodlands,
Darkened by shadows of earth, but reflecting an image of heaven?
Waste are those pleasant farms, and the farmers forever departed!
Scattered like dust and leaves, when the mighty blasts of October
Seize them, and whirl them aloft, and sprinkle them far o'er the ocean.
Naught but tradition remains of the beautiful village of Grand-Pré.

GRAND RAPIDS, Mich., the county seat of Kent County, popularly called the *Furniture City* from the importance of its principal manufacture. It is thirty miles from Lake Michigan, in the southwestern part of the state, and on the Grand River. Lansing and Detroit are respectively sixty and 145 miles southeast, and Chicago is 189 miles southwest. The Grand River descends here eighteen feet in the course of a mile, a circumstance which gave the city its name. Some of the power required by the many industries is furnished by means of a dam. The river is crossed by a number of bridges, some constructed of concrete. Below the rapids, the stream is navigable to the lake, and the city has steamboat connections with Grand Haven, Milwaukee, Chicago and other lake ports. Freight and passenger service is provided by the Pere Marquette, the Michigan Central, the New York Central, the Grand Trunk and the Grand Rapids & Indiana railroads. Interurban electric lines operate to Muskegon and other lake-shore towns, and through Kalamazoo across the state to Detroit. The population, twenty-five per cent of which is Dutch, was 112,571 in 1910; in 1916 it was 128,291, by Federal estimate. The area is about seventeen square miles.

Parks, Streets and Buildings. Grand Rapids is attractively located between low hills in a valley about two miles in width. John Ball, Antoine Campan, Highland and Fullerton Street parks combined contain about 115 acres. These with a number of smaller parks are valued at $350,000. The West Michigan Fair Association owns Comstock Park, which contains 100 acres. Reed's Lake, on the east limits of the city, and North Park, along the river, are popular summer resorts. Canal, Monroe and Division are the main business streets; the better residence section is along the eastern hills.

Prominent among the buildings are the Federal building, erected at a cost of $375,000, a $250,000 courthouse, a $300,000 city hall, the United States courthouse, Masonic Temple, Pythian Temple, Knights of Columbus Hall, Elk Hall, clubhouses for both men's and women's clubs, a $300,000 Y. M. C. A. building, Kent Scientific Museum, the Union Station, Saint Mark's (Episcopal) and Saint Andrew's (Catholic) cathedrals, and a number of fine hotels, banks and churches. The Ryerson Public library contains nearly 100,000 volumes, and is a gift of Martin A. Ryerson of Chicago to his native city.

Institutions. The educational institutions include the Holland Theological Seminary (one of the important schools of the Dutch Reformed parochial system), and several public and private schools and business colleges. Grand Rapids is the seat of Roman Catholic and Protestant Episcopal bishoprics. The benevolent and charitable institutions include the Butterworth Hospital, Woman's Home and Hospital, the Union Benevolent Association Home and Hospital, the City Home for the Treatment of Contagious Diseases, Saint Mary's Hospital, Blodgett House for Children, Emerson Home, Home for the Aged, Holland Union Benevolent Association Home and Saint John's Orphan Asylum. Overlooking the river about one mile north of the city is the Michigan Soldiers' Home; three miles east is the Michigan Masonic Home.

Industries. Grand Rapids is famous all over the world for its furniture-manufacturing industries. In the United States it is outranked in quantity in this industry only by New York and Chicago, in the order named. The annual output exceeds $13,500,000 in value, and in the industry over 10,000 men are employed. Twice a year, in January and July, wholesale buyers from all over the United States and abroad meet in Grand Rapids to see the new furniture and buy their stock. Outside producers exhibit here also, and in the city are several enormous buildings for that specific purpose. From the large wholesale and jobbing houses, groceries, dry goods, millinery, carpets, drugs, crockery, paper, boots and shoes, knit goods, hardware and mill supplies are distributed to Western and Northern Michigan.

The largest manufactories of carpet sweepers and fly paper in the country are located here, and among the other important enterprises are flour and grist mills, machine shops and foundries, bakeries, lumber and planing mills, carriage and wagon factories, and manufactories of show cases, metal belt lacers, button (shoe) machinery, window-sash pulleys, hosiery and knit goods, wood ornaments, tobacco and cigars and clothing. Large gypsum quarries near the city furnish material for the manufacture of gypsum plaster and allied products. The printing industry is also important.

Grand Rapids is centrally located in the great Western Michigan fruit belt and is an important shipping point for fruit, grain and vegetables produced in the surrounding country. Important among the fruits grown are peaches, apples, cherries, plums, pears and

small berries. Chicago, Cincinnati, Saint Louis and even New York buy winter lettuce in Grand Rapids. One very popular variety of winter lettuce which originated here has been given the name of the city.

History. An Ottawa Indian village for many years occupied the present site of the city. A Baptist mission for the Indians was established there in 1824. A trading post and sawmill were built later and the settlement became a town in 1834. It was incorporated as a village in 1838, and chartered as a city in 1850. The commission plan of government became effective in 1917. The waterworks plant is owned by the city. L.H.B.

GRAND REMON'STRANCE, a document presented to Charles I of England by the House of Commons in 1641, setting forth the grievances which they had against him. The outbreak of the Irish rebellion and the rumored intrigues of the king with the Earl of Montrose incited the Puritan party to call him to account. On November 22, while the king was in Scotland, the Commons adopted the Grand Remonstrance by a majority of eleven, after a heated debate. The document enumerated acts of misgovernment extending over the king's entire reign, such as the levying of forced loans and the abuses of the courts of Star Chamber and High Commission.

Charles I ridiculed the Remonstrance and refused to take it seriously. On December 10 he issued a proclamation on religion as an indirect reply, and on December 23 sent an evasive answer to the manifesto. On January 3, 1642, he sent his attorney-general to impeach the five leaders of the Opposition responsible for the Remonstrance before the House of Lords. This act was one of the causes of the civil war in England which resulted in the execution of the king in 1649 and the establishment of the Commonwealth, under Oliver Cromwell. See COMMONWEALTH OF ENGLAND.

GRANGE, *graynj,* the popular name for the Patrons of Husbandry, a secret order in the United States, which was organized in the interests of agriculture but which developed political power because of its numerical strength. In 1866 the government sent O. H. Kelley, of the staff of the Department of Agriculture, to report on agricultural conditions in the South and to devise means of improving them. He found the farmers very poor, backward and discouraged. In December, 1867, he organized the National Grange of Patrons of Industry. The local bodies were called *granges,* and each state had its state grange. In 1873 there were over 10,000 granges in the United States, and in 1875 its membership was 1,500,000, distributed through every state in the Union.

The influence of the grange was potent in reducing railroad rates, abolishing trusts, futures, etc. The most important fruits of the order were the organization of the Department of Agriculture as a Cabinet office, the act for founding experiment stations and the Interstate Commerce Commission. The political element finally took separate shape under the Farmers' Alliance and the Populist Party, after diminishing its own influence by poor management.

GRANITE, one of the most widely known and popular building stones, is crystallized rock composed of three common minerals, quartz, feldspar and mica, each of which is easily distinguished in the rock. Take a piece of granite and examine it carefully. One part looks like glass; this is the *quartz.* Surrounding the glasslike particles is a substance with a pearly luster; this is the *feldspar.* Scattered all through the rock are flat, shiny crystals that can be split with a knife-blade into very thin pieces; these crystals constitute the *mica.*

We usually think of granite as a gray rock, but it may be of almost any color, from nearly white to black. When both the feldspar and the mica are white, the granite is a light gray. If the mica is black, we have a dark gray. If the feldspar is of any shade of red, we have a red granite. If the feldspar is green, the granite is greenish in tint.

Granite is extensively used in the construction of buildings, for piers of bridges, walls of dams, and wherever great strength and durability are required. It has also almost entirely replaced marble for headstones and monuments. It takes a high polish, and is one of the most beautiful stones used in the arts. It weighs about 167 pounds to the cubic foot and will withstand a pressure of from 5,000 to 20,000 pounds to the square inch without crushing. It is more difficult to quarry and work than limestone or sandstone, but the invention of stone-cutting machinery now makes it available for all purposes. One of Chicago's largest structures, the People's Gas Building, contains eighteen massive granite columns, highly polished, each weighing thirty-one tons and costing $10,000.

Granite is quarried in practically every state crossed by the Appalachian Mountains, and in

California, Colorado, Minnesota, Wisconsin and Wyoming. There are also valuable quarries in British Columbia, Quebec and Nova Scotia. The four leading states in order of production are Vermont, Massachusetts, California and

AVERAGE ANNUAL PRODUCTION OF GRANITE

The comparative value from each of the leading states is given emphasis by means of the graphic illustrations.

Maine. Bunker Hill Monument is built of Quincy, Mass., granite, and the Grant Monument, on Riverside Drive, New York City, is of granite quarried in Wisconsin.

In some varieties hornblende replaces the mica; these varieties are called *syenite* by geologists, but practical stone workers call them granite. The name comes from Syene, Egypt, where the ancient Egyptians quarried this rock for their pyramids, statues and temples. The Scotch granite used for headstones is a Scotch syenite. When the mica forms in layers the granite becomes gneiss.

There are a number of theories concerning the formation of granite, but they all agree that it was formed under great heat and was once in a molten state. When it cooled the minerals crystallized as we now see them in the rock. Granite has been formed at different geologic periods in the world's history, but most of it is considered to be one of the rocks earliest formed. W.F.R.

For comparison of durability of granite and other stone, see BUILDING STONE. The reader is also referred to the following articles in these volumes:

Feldspar	Igneous Rocks
Geology	Mica
Gneiss	Quartz

GRANITE CITY, ILL., an important railroad center, noted also for its extensive granite-ware industry, from which it receives its name. It is situated in Madison County, near the Mississippi River, in the southwestern part of the state, nine miles north of East Saint Louis and eighteen miles south of Alton. Transportation facilities are provided by the Wabash; Chicago & Alton; Cleveland, Cincinnati, Chicago & Saint Louis; Chicago & Eastern Illinois; Chicago, Peoria & Saint Louis; Clover Leaf, and the Illinois Central railways, and by the Merchants' Bridge and Saint Louis terminals. Interurban electric lines connect with cities north, east and south, and a thirty-minute ride on one of these takes passengers from Granite City to the heart of Saint Louis, on the opposite side of the Mississippi. The city was founded in 1894. About one-third of the inhabitants are foreign born; the population increased from 10,000 in 1910 to 15,142 in 1916. The area of the city is nearly four square miles.

In addition to the manufacture of granite ware, the city has extensive steel, lead and corn industries. Madison and Venice adjoin Granite City on the south, and the three are known locally as the Tri-Cities; Venice is situated on the east bank of the Mississippi River, and through it Granite City has additional transportation facilities. The abundant supplies of water and coal in the vicinity increase the manufacturing facilities. Saint Elizabeth's Hospital and a high school building are among the notable structures. Besides public and sectarian schools, the city has a library. J.C.R.

GRANT, FREDERICK DENT (1850-1912), eldest son of Gen. Ulysses S. Grant and himself a soldier before he was thirteen years of age. During the last years of the War of Secession he accompanied his father in nearly all the latter's campaigns, and in 1867 entered West Point Military Academy, from which he was graduated in 1871. He worked as an engineer on the Union Pacific Railway, accompanied General Sherman to Europe for a brief visit, and from 1873 to 1879 was lieutenant-colonel on Sherman's staff in numerous expeditions against the Indians. He resigned from the army in 1881, was United States minister to Austria from 1889 to 1893, and was the police commissioner of New York City for four years.

At the outbreak of the Spanish-American War he was appointed colonel, and soon brigadier-general of volunteers, and saw service in Cuba and the Philippines. In 1901 he was appointed brigadier-general in the regular army and in 1906 major-general. He was at various times in command of the military districts of Southern Luzon, Northern Luzon, the Department of Texas, Department of the Lakes (at Chicago) and Department of the East (New York City). He was in command of this last department at the time of his death.

GRANT, GEORGE MONRO (1835-1902), a Canadian author, clergyman and educator, one of

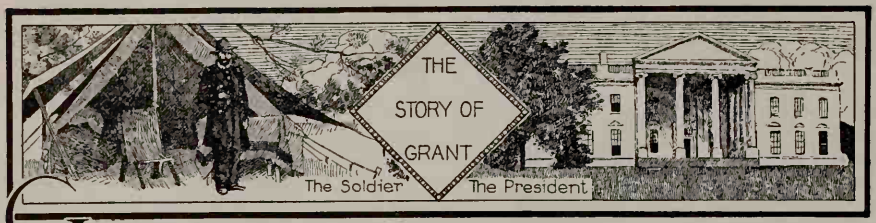
the most brilliant and most versatile men of his time, noted for his eloquence on the political platform no less than in the pulpit. He was for twenty-five years the distinguished principal of Queen's University, which was transformed, under his leadership, from a small denominational college into one of Canada's leading educational institutions. Dr. Grant was born at Albion Mines (now Stellarton), N. S., and attended Pictou Academy, where he took more than his share of prizes and was also known as the best fighter of his age in the school. When he was eighteen he was chosen by the Synod of Nova Scotia as one of four young men who were to be sent to the University of Glasgow to be fitted for the Presbyterian ministry. At Glasgow his career was brilliant; he took highest honors in philosophy and first prizes in the classics, moral philosophy and chemistry. At the same time nothing better testifies to his unique position among his fellow students than that he was president of the Conservative Club, of the Missionary Society and of the Football Club. In addition to these activities he earned his own living, and after four years of college was able to repay to the Synod the money which had been advanced to him when he left Nova Scotia.

GEORGE MONRO GRANT

On the completion of his studies in 1860 he was ordained a minister, and the next year returned to Canada, where the varied interests characteristic of him in boyhood were no less prominent in manhood. After spending two years as a missionary on Prince Edward Island, he was made pastor of Saint Matthew's Church, Halifax, where he remained until he was chosen, in 1877, to the principalship of Queen's. The years at Halifax were busy ones, for in addition to his usual pastoral duties he acted as trustee of Dalhousie University and of the Presbyterian Theological Seminary and served on numerous committees of the church. He was one of those responsible for the union of the four branches of the Presbyterian Church in Canada in 1875. He was an ardent and public advocate of Confederation of the provinces in 1867 and was always interested in political affairs. It was typical of the man, however, that his activity was not confined to his Church or to his party, and every good cause was sure of his support. The converse was also true, that any cause he supported was sure to be a good cause, with the result, as one of his biographers says, that probably "no man in Canada ever succeeded as Dr. Grant did while in Halifax in raising money for various worthy objects connected with education, religion and general benevolence."

From 1877 until his death he held, as principal of Queen's, a conspicuous place in the educational world. A born leader and a splendid worker, he gathered around him an enthusiastic band of helpers, and under him every department of the university developed with great rapidity. As a teacher he was always interesting, probably because he himself was always interested, both in young men and in teaching. In later years he became an ardent Imperialist, and he lost no opportunity to emphasize his opinion that Canada's future was bound up with the British Empire. He wrote many magazine articles and pamphlets, and a few books, including *Ocean to Ocean,* the account of an overland journey from Toronto to British Columbia in 1872; *Our National Objects and Aims; Advantages of Imperial Federation; The Religions of the World; Reformers of the Nineteenth Century;* and *French-Canadian Life and Character.* G.H.L.

GRANT, Robert (1852-), an American writer whose *Unleavened Bread,* a "problem" novel of the less unpleasant type, was one of the popular books of its year. Grant was born in Boston and studied at Harvard, receiving his Doctor's degree and graduating in law from that institution. He began to practice law in his native city in 1879, and from the first was successful. In 1888 he was made a water commissioner for Boston, and five years later was appointed judge of the Probate Court and of the Court of Insolvency for Suffolk County, Mass. This post he has held ever since, and since 1895 he has been an overseer of Harvard University. He married in 1883 a daughter of Sir Alexander T. Galt of Montreal. Judge Grant's works include, in addition to the novel mentioned above, *The Undercurrent, The Bachelor's Christmas, The Orchid* and *The Chippendales,* and volumes of essays entitled *The Opinions of a Philosopher* and *The Art of Living.* He has never lived elsewhere than in Boston.

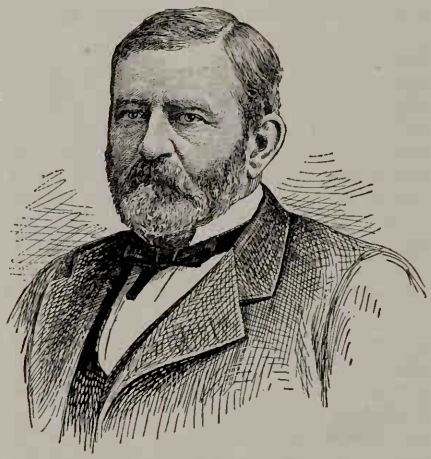


GRANT, ULYSSES SIMPSON (1822-1885), an American soldier and statesman who achieved his great fame as commander-in-chief of the Federal armies during the last year of the War of Secession, when he directed the final campaigns of that terrible struggle. With a singleness of purpose and an unyielding determination that wore out the defense of his gallant opponents, Grant hammered his way to victory and became the savior of the Union. The keynote of his military career is revealed in the message which he sent to Washington from the battlefield of Spottsylvania, where for two weeks, in 1864, the Confederate armies had held Grant's forces in check: "I propose to fight it out on this line, if it takes all summer." In 1868 a grateful people elected him to the highest civil office in the United States, the Presidency, and reëlected him four years later.

Grant was born on April 27, 1822, at Point Pleasant, Clermont County, Ohio. His father, Jesse Grant, was seventh in descent from Matthew Grant, a Scotchman who was one of the original settlers of Dorchester, Mass., in 1630,

HIS BIRTHPLACE

and was one of the founders of Windsor, Conn., in 1635. Noah Grant, grandfather of Ulysses, fought in the Revolutionary War, and at its close migrated first to Pennsylvania and later to Ohio. Jesse Grant, the father of Ulysses, was a tanner by trade, and at one time was in the employ of Owen Brown, the father of John Brown of Osawatomie. In 1822, when Ulysses was born, Jesse Grant was in business for himself at Point Pleasant, but in the next



ULYSSES SIMPSON GRANT
A man who was almost a failure until "he found his work."

year the family removed to Georgetown, about forty miles southeast of Cincinnati. Here Ulysses spent his boyhood, working on his father's farm in summer and attending school in winter. His father, ambitious for his son's advancement, secured for him in 1839 an appointment to West Point, where Ulysses was graduated in 1843.

It was at West Point that Grant adopted the name "Ulysses Simpson." He had been baptized Hiram Ulysses, but was known to his family and friends as Ulysses. The member of Congress who appointed him to the military academy thought that Ulysses was his first name, and that his middle name was probably that of his mother's family, Simpson. The appointment to West Point was therefore made in the name of Ulysses Simpson Grant. The West Point officials were notified of this mis-

take by the new cadet, but they did not feel authorized to correct it. Ulysses Simpson he was on the rolls, and Ulysses Simpson he remained to the end of his days.

At graduation, in 1843, he was appointed second lieutenant and was then assigned to duty at Saint Louis. In the autumn of 1845, with his regiment he joined the army of occupation in Texas, and during the Mexican War took

THE GRANT HOME IN GALENA

Preserved by the city as "Grant Memorial Home," with the aid of an appropriation by the state of Illinois. In it are displayed memorials of the Grant family

part in every important battle except that of Buena Vista. He was brevetted first lieutenant for conspicuous services at Molino del Rey, and was brevetted captain for bravery at the storming of Chapultepec (see BREVET). For several years after the close of the war he was assigned to garrison duty in various parts of the United States. In the meantime, August 28, 1848, he had married Miss Julia Dent, the sister of a West Point classmate, but when he was detailed to duty in California his wife and children remained in Saint Louis. Two years of separation from his family and the seemingly endless prospect of garrison life led him to resign his commission on July 31, 1854.

Returning to Saint Louis, Grant settled with his family on a sixty-acre tract which his father-in-law set aside for them. Here, for nearly four years, Grant lived the life of a farmer. With his own hands he built a log cabin, which he called "Hardscrabble." He cleared the land, plowed and hoed, hauled wood to the mines, and worked hard all the time. But his efforts met with little success, and in May, 1860, he took his family to Galena, Ill., where he became clerk in a leather and hardware store owned by his father. He was thus employed when the War of Secession broke out—the event which so completely changed his prospects.

It is the truth, and no reflection on his abilities as proved at a later time, that in 1861 Grant was regarded by his family and friends as a broken man. He was nearly forty years old, he had tried first one occupation and then another, and had been successful in none. His army career had started well enough, but apparently wasted into nothing. As a farmer he had barely been able to make a living on land which cost him nothing, and some real estate dealings by which he hoped to improve his financial affairs turned out badly. In 1861 his younger brother, who managed the Galena store, felt that the services of the future President were worth only $15 a week.

His Great Military Service

In the War of Secession. Immediately after the commencement of hostilities he offered his services to the national government, but received no reply to his letter. Meanwhile, he was acting as mustering officer of the Illinois volunteers, and in June was chosen colonel of the Twenty-first Illinois regiment of infantry. After several months he was made brigadier-general of volunteers and was given command of the district of Southeastern Missouri, with headquarters at Cape Girardeau. Learning that Confederate forces were about to seize Paducah, Ky., at the junction of the Tennessee and Ohio rivers, he occupied the city on his own initiative, and thus prevented the enemy from gaining a foothold in Western Kentucky. His first battle as a commander was at Belmont, Mo., where he showed himself a capable leader, though he achieved no material advantage. Early in 1862 he saw the strategic importance of Fort Henry and Fort Donelson (which see), and after much pleading for permission was allowed to undertake the campaign which ended with the capture of those forts. His reward was promotion to the rank of major-general of volunteers. It was at Fort Donelson that Grant won his nickname, "Unconditional Surrender." When General Buckner, in command of the Confederate forces, asked that commissioners be appointed to arrange terms for surrender, Grant replied: "No terms other than unconditional and immediate surrender can be accepted. I propose to move immediately upon your works." The

public appreciated its own little joke, and Grant's initials, "U. S.," were said to stand for "unconditional surrender."

Although Grant was now famous, he was soon in difficulty. About this time he quarreled with General Halleck, his chief, and was virtually placed under arrest. He was allowed to keep his command, however, and at the Battle of Shiloh just managed to save his army from annihilation. At Shiloh Grant displayed great bravery, but did not seem quite equal to all emergencies. At any rate Halleck thought so, and made Grant second in command of the combined armies of the Tennessee and the Ohio, a nominal command which had no important duties and which the army regarded as indicating that Grant was in disgrace. Grant's fortunes were to sink but one step lower, with the collapse of the first campaign against Vicksburg, before they turned. The defeats before Vicksburg in December, 1862, were relatively unimportant, but they led many well-intentioned persons to believe that Grant was unfitted for command. There were rumors, too, that he was frequently intoxicated, and there is little doubt that he would have been forced into retirement had it not been for Lincoln's firm support. Lincoln seems to have recognized Grant's ability at an early date, and deliberately disregarded all rumors, true or false, about him. On one famous occasion, when a committee called on him to demand Grant's removal for intoxication, Lincoln jokingly asked the critics to find out what brand was Grant's favorite, so that kegs of it might be sent to the other Union generals.

Lincoln's faith in Grant was finally vindicated by the successful end of the Vicksburg campaign. After the surrender of the forts on July 4, 1863, Grant was made a major-general in the regular army, and several months later took command of a great army at Chattanooga. In the battles around Chattanooga, in November, 1863, he destroyed the foothold of the Confederacy in the center and west. It remained only to destroy its power in the east. To this end Grant was made commander-in-chief, with the rank of lieutenant-general of all the Federal armies in the field, and himself took command of the Army of the Potomac. From this time to the end, the war in the east was a series of almost continuous battles. Grant never relaxed his hold, and in spite of occasional checks and partial defeats, pursued his policy of wearing his opponents down. His relentless campaign for Richmond, though carried on with a sacrifice of life which would have sickened and disheartened a less determined commander, had its inevitable result in the surrender of the heroic Lee at Appomattox Court House, on April 9, 1865.

His Fame as a Soldier. Grant was a great commander, and few commanders of any country are his peers. Yet it is not fair to say that Grant was a great soldier born. Personally courageous and daring almost to a fault he was, but he learned the art of campaigning in the bitter school of experience. The buoyant, energetic Grant who fought at Shiloh was not the same grim figure which led the way from Vicksburg to Appomattox. After all, it is immaterial whether Grant originally possessed the needed qualities or whether he acquired them, but the fact is that he did have the energy, the judgment and singleness of purpose to carry his task to its conclusion. McClellan had greater *finesse,* Rosecrans was more brilliant and Buell was more exact and careful, but none of these Federal generals seemed to combine these qualities in the right proportions.

Peace and Politics. After the death of Lincoln, President Johnson and others in authority showed a disposition to treat the Confederate leaders with severity. Indictments for treason were brought against Lee and several others, in absolute disregard of the terms of surrender. Grant protested against this breach of faith, and even threatened to resign from the army if the President did not heed his protest. In 1866 Grant was promoted to the rank of general, a grade higher than any other American soldier, not excepting Washington, had held before him. In 1867, after President Johnson had suspended Secretary of War Stanton, Grant was appointed to succeed him, but he was only too glad to resign when the Senate refused to confirm the President's action. His eagerness to keep out of the controversy between Congress and the President led to bitter feeling between him and Johnson, and brought Grant into politics in spite of himself.

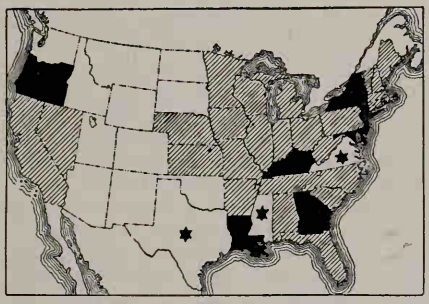
Grant had never taken any interest in politics; in fact, he had only voted at one Presidential election, that of 1856, when he cast his ballot for Buchanan. In 1868, politically considered, he was an unknown quantity. A number of leading Democrats even approached him with a proposal to make him the Democratic nominee for President, but the effect of his quarrel with Johnson had been to bring him

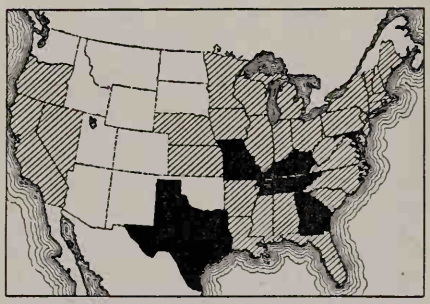
into closer touch with the Republicans in Congress. He was, moreover, in general accord with the Republicans on the tariff, the national banking system and internal improvements. He was unanimously nominated by the Republican convention on the first ballot, and was elected by the large majority of 214 electoral votes to eighty for Horatio Seymour, the Democratic candidate. (See map below, for party division of states.)

Grant, the President

His Administration (1869-1877). When Grant took office as the eighteenth President, he fell heir to a reconstruction policy only partly carried out (see RECONSTRUCTION). The Fifteenth Amendment to the Constitution, which guaranteed the right of suffrage without regard to "race, color or previous condition of servitude," was passed by Congress before Grant became President. It had his active support, however, from the beginning, and when it was ratified and declared in force, March 30, 1870, he declared that it was "a measure of grander importance than any other one act of the kind from the foundation of the government to the present day." Meanwhile, reconstruction was not proceeding satisfactorily, and conflicts between the negroes and their late masters became so frequent and violent that Congress, at the President's request, passed the Force Acts, which authorized the President to suspend the writ of *habeas corpus* in any district and to declare martial law. When repeated warnings did not bring about the desired results, Grant used these extraordinary powers in parts of North and South Carolina, and even instituted prosecutions against several prominent offenders, with the result that a measure of quiet was restored.

The President also intervened in a number of contested elections in the South and sent Federal troops to support the Republican candidate. In these instances many people felt that the President had acted with unnecessary harshness. In May, 1872, the reconstruction policy, so odious to the South, was modified by the passage of the Amnesty Act, restoring civil rights to all but about 300 persons in the South; this marked the beginning of the end of "carpet-bag" rule (see CARPETBAGGERS).





1868 GRANT'S TWO ELECTIONS 1872

The shaded states are those that gave their electoral votes to Grant; the black-colored states supported the Democratic ticket; the white areas represent non-voting territories. In the election of 1868 Virginia, Mississippi and Texas (starred on the above map) did not participate in the Presidential election, for until 1870 they did not comply with Federal requirements which had been imposed upon the states of the former Confederacy.

Vigorous Foreign Policy. During the election campaign Grant had given little indication of the policies he would pursue if elected, but he had the confidence of the public, which was increased by the speedy negotiation of the Treaty of Washington and the settlement of the Alabama Claims (see WASHINGTON, *Treaty of;* ALABAMA, *The*). In one respect, however, the President's policy failed to meet general approval. In 1869 the government of Santo Domingo sought annexation to the United States. Grant was heartily in favor of this step, and tried for several years to bring it about, but the United States Senate finally refused to approve the treaty of annexation. In another West Indian island, Cuba, an insurrection had been going on for several years, and American citizens and ships in Cuban territory had occasionally been detained by the Spanish authorities on the pretense that they were aiding the insurgents. The climax of

these seizures was the Virginius Massacre (which see), which created intense excitement in the United States and almost led to war. Grant, however, by acting with firmness and promptness, won from Spain a complete apology and full reparation for the outrage.

Election of 1872. Chiefly as the result of the administration's policy toward the South, a considerable faction in the Republican party felt that Grant's reëlection would be a calamity. This faction, led by Charles Francis Adams, Carl Schurz, Charles Sumner and Horace Greeley, organized the Liberal Republican party at a convention in Cincinnati in May, 1872. The original intention was to nominate Adams for President, but the convention was stampeded for Greeley, who was still unpopular in the North for his act in signing Jefferson Davis' bail bond. The Democrats accepted Greeley as their candidate, while the Republicans renominated Grant. Grant was elected by a popular vote of 3,597,000 to 2,834,000 for Greeley. Grant received 286 electoral votes to 63 votes for Thomas A. Hendricks, B. Gratz Brown and the other candidates, Greeley having died before the electoral college met (see GREELEY, HORACE).

Financial Legislation and the Panic of 1873. Early in 1873 Congress passed a coinage act which received little attention at the time. At that time neither gold nor silver was in circulation, the government had not resumed specie payments, and the only currency was bank notes and "greenbacks." This act dropped the silver dollar from the list of standard coins, a procedure which was denounced a few years later as the "crime of 1873." When the act was passed no silver dollars had been coined for twenty years, and it was not until later, when the free silver agitation swept the country (1896), that great political capital was made of the act of '73.

Another noted fiscal law of 1873 is known in history as the "salary grab." The act raised the salary of the President from $25,000 to $50,000, and increased the salaries of all Federal judges and of members of Congress, including the members of the Congress which passed the bill. This last feature was violently opposed by the public, which expressed its indignation so forcibly that so much of the act as related to Congressmen's salaries was repealed.

The "salary grab" was merely an incident in a time of riotous wastefulness which could have but one end. Overproduction, overtrading and overexpansion of credit led to one failure after another among the banking houses of New York, until the country was seized with panic. Credit was refused, savings banks suspended payment, factories shut down and their owners were driven into bankruptcy, and many of the railroads were forced into the hands of receivers. To relieve the money stringency Congress passed the so-called Inflation Bill, providing $100,000,000 in inconvertible paper currency. Grant vetoed the bill, a courageous act for which the country owes him a great debt, and largely through his efforts and those of John Sherman, then Senator from Ohio, Congress passed an act for the resumption of specie payments (see SPECIE PAYMENTS, *Resumption of*).

Scandal and Corruption. For nearly half a century the United States had seen more or less corruption in high places, but Grant's administration seems to have been fixed by some evil genius as the time for the worst disclosures. Unfortunately for Grant's reputation, both then and now, his praiseworthy actions were sometimes overshadowed by the faults of his subordinates. One of Grant's most lovable traits was a simple trust in his friends; he found it impossible to think evil of any man to whom he had given his friendship. It was his misfortune that some of his friends took an ignoble advantage of his trust. The affair of the Credit Mobilier, the Whisky Ring and the Star Route Frauds, although these last were not exposed until the Hayes administration, were but typical of the existing laxness of morals (see CREDIT MOBILIER; STAR ROUTE FRAUDS). In New York City the Tweed ring was finally broken up in 1871, but in 1876 Grant's Secretary of War, W. W. Belknap, resigned to avoid impeachment for selling contracts for army supplies. Fraud was discovered in the customs service and in the Indian Bureau. Grant had made at least one attempt to reform the government service; he had secured the Civil Service Act of 1871, but two years later Congress blocked further reform by refusing to appropriate funds.

Other Items of Interest. One of the most noteworthy features of Grant's term was the sudden rise of the "Grangers," or "Patrons of Husbandry" (see GRANGE). Equally interesting was the first appearance, in 1876, of a national Prohibition party. In 1873 Congress passed a law ordering the issue of the first one-cent postal cards, and in 1876 admitted Colorado to the Union. The year 1876 also

OUTLINE AND QUESTIONS ON U. S. GRANT

Outline

I. Years of Preparation

(1) Birth and ancestry
(2) Education
(3) Service in Mexican War
(4) Unsuccessful attempts at farming and at real-estate dealings

II. War of Secession

(1) Early activities
(2) "Unconditional Surrender"
(3) Ebb of his fortunes
(4) The Vicksburg campaign
(5) Campaign for Richmond

III. His Administration—1869-1877

(1) Reconstruction
  (a) Fifteenth Amendment
  (b) Force Acts
  (c) Suppression of Ku-Klux Klan
  (d) Intervention in local elections
(2) Important legislation
  (a) Civil Service Act, 1871
  (b) Coinage Act, 1873
  (c) Inflation Bill
  (d) Resumption Act of 1875
(3) Political corruption and financial disorders
  (a) Credit Mobilier
  (b) Whisky Ring
  (c) "Salary Grab" Act
  (d) Tweed Ring
  (e) Panic of 1873
(4) Foreign affairs
  (a) Treaty of Washington
  (b) Alabama Claims settled
  (c) Virginius Massacre
  (d) Attempted annexation of Santo Domingo
(5) Other important events
  (a) Election of 1872
  (b) Election of 1876
  (c) Indian risings
  (d) Chicago and Boston fires
  (e) Bell telephone patented
  (f) Union Pacific Railway completed
  (g) Centennial Exposition

IV. Later Events

(1) Trip around the world
(2) Business losses
(3) *Memoirs*
(4) Death

Questions

Give the origin of Grant's popular nickname.

How much larger was Grant's salary in 1871 than it had been ten years earlier?

What was the Ku-Klux Klan, and how did the administration deal with it?

What is there in the last years of Grant which reminds you of the last years of Sir Walter Scott?

What interesting fact shows Grant's complete lack of interest in politics?

Name two extremely important inventions which were brought before the public during this administration.

Why was Grant without a commission at the outbreak of the War of Secession?

When and why did he threaten to resign from the army?

When did Grant's firmness prevent a possible break with a country with which the United States did go to war twenty-five years later?

In what way would it have been better if Grant had not had such implicit faith in his friends?

What was Grant's real name and why was he not known by it?

What was the "salary grab," and how was it changed because of public disapproval?

What famous saying of Grant shows the dominant trait in his character?

To whom did he owe his continuance in the army despite various failures?

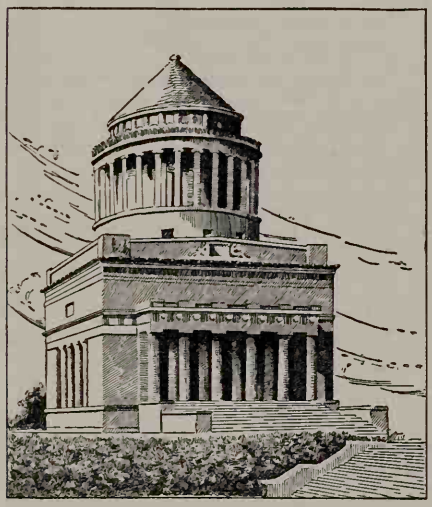
In what way did his early life differ from that of Lincoln or of Garfield?

What was the chief significance of the battles around Chattanooga?

Mention one instance in which Grant used his veto power with good effect.

marked the completion of the first century of American independence, and was fittingly celebrated by a great Centennial Exposition (which see) at Philadelphia. Two of the exhibits there were recent inventions, then still regarded as of little practical value—one was the incandescent electric light, the other was the Bell telephone.

During the eight years of Grant's Presidency the United States was at peace with the rest of the world, but within its own borders there was savage warfare. In 1871 and 1872 the Apache Indians in Arizona and the Modoc Indians in California were on the warpath, and



TOMB ON RIVERSIDE DRIVE

It faces south, with the Hudson River many feet below, at the left. In an open circular vault a dozen feet below the marble floor of the main room, over which a purplish light is diffused, lie side by side the President-General and his wife, Julia Dent Grant. In small adjoining rooms are preserved mementos of the period of the War of Secession. The building was constructed of Wisconsin stone, quarried at Montello.

in 1876 the Sioux Indians, led by Sitting Bull, massacred gallant General Custer and his entire force in Dakota Territory (see CUSTER, GEORGE A.). The Chicago Fire of 1871 and the Boston Fire of 1872 were disasters of a different kind. During the closing months of Grant's term the great issue before the people was the contested election, full details of which are given in the article on Rutherford B. Hayes.

Around the World and Home Again. In May, 1877, just two months after the inauguration of his successor, Grant started on a trip around the world in company with his wife and eldest son, Frederick. He sailed from Philadelphia to Liverpool, and visited the British Isles and the great cities of continental Europe. From Marseilles he went to Egypt and the Holy Land, thence to India, China and Japan, and finally back to America at San Francisco, where he landed in September, 1879. Everywhere he was enthusiastically received, not merely as the ex-President of the United States, but as one of the greatest soldiers of modern times.

In 1880 a determined attempt was made to nominate Grant for a third term, but he himself took no part in the campaign. Soon afterward he removed from his old home at Galena, Illinois, to New York, where he invested all his capital in the banking firm of Grant & Ward, of which his son was a partner. The mismanagement of the junior partners brought the firm to bankruptcy, and left the General, then sixty-two years old, penniless. To help support himself he wrote a series of magazine articles on his principal campaigns. These were so successful that they led several publishers to make handsome offers for his personal memoirs, the story of his life to the end of the War of Secession. When he realized that he was suffering from cancer he redoubled his efforts to finish the book, and the last word was written only four days before his death, which occurred on Mount McGregor, near Saratoga, N. Y., on July 23, 1885. His body now lies in a great tomb on Riverside Drive, New York City; this tomb was paid for by popular subscription, and was dedicated by President McKinley on April 27, 1897. W.F.Z.

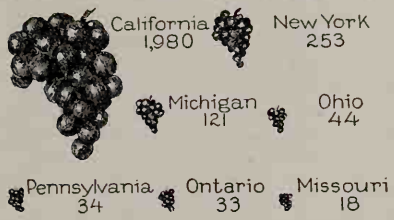
Consult Nicolay's *The Boys' Life of Ulysses S. Grant;* Hosmer's *The Outcome of the Civil War;* Garland's *Grant: His Life and Character.*

GRANULATION, *gran u la' shun,* a healing process occurring in open wounds. The granulation consists of small pebbly masses of fleshy matter which grow over the wound and assist in the gradual closing and healing. Sometimes the granulations are forced upward, beyond the surface of the wound. Such growth is commonly known as proud flesh, and differs greatly from the healthy granulations. Proud flesh is usually removed by the surgeon's knife or treated with strong caustics.

The term *granulation* is sometimes applied to lumps or sores appearing on the inner portions of the eyelids and on the eyeball itself. The scientific name for the disease in which these symptoms occur is *granular conjunctivitis,* but it is more commonly referred to as granular eyelids. One form of granular con-

junctivitis is the very contagious disease known as trachoma. Granular eyelids may be easily spread by carelessness in regard to towels and other toilet requisites. Anyone suffering from this malady should see that no other member of the family uses the same articles of toilet that he does. W.A.E.

GRAPE, the fruit of the vine, probably the first fruit cultivated by man. It was known to the Egyptians at least three thousand years ago,



Figures Represent Millions of Pounds

GRAPES GROWN IN A YEAR

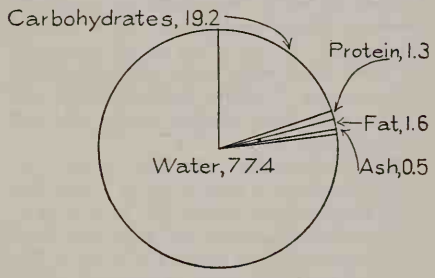
The average crop in seven leading centers of production.

and among the ancient Greeks and Romans its use was common. From the days of earliest history the vine has been a favorite plant, not only on account of its delicious fruit and the wine it yields but because of the grateful shade afforded by its climbing stems and large leaves. In the Bible we read that the Israelites dwelt in safety, each under his "vine and fig tree" (*I Kings* IV, 25), and how Pharaoh's cupbearer dreamed a dream concerning a vine (*Genesis* LX, 9-11). At the present day the grape is one of the most important of food fruits; it appears almost daily in some form in the diet of nearly all countries of the world. The earliest cultivated species was derived from the wild grape found on the eastern coasts of the Mediterranean Sea and in the neighborhood of the Caspian Sea. The varieties now cultivated number many hundreds.

Methods of Culture. The grape is a climbing plant, with large, three-lobed leaves, and clings to every available support by means of tendrils. The wild grape is propagated by seeds, but the usual method of culture is by taking cuttings or layers from established vines. Cuttings are usually taken from the winter trimmings of the vine and are planted in the early spring in well-worked and fertilized ground. When the cuttings have reached the age of two years they are transplanted to the vineyard or wherever it is decided to place them. Layers are taken by bending a shoot of a growing vine down to the ground and covering two or three joints or "eyes" with earth. Roots then sprout downward and shoots grow upward from each eye. These may be separated from the buried branch and transplanted. Few if any plants require less care than grapevines, but on the other hand none responds more readily and bountifully to good treatment.

Care must be taken to prevent the young vine from overburdening itself, for one that bears too heavily at first may become permanently weakened. The first season after transplanting the vine should not bear any fruit at all; from three to six clusters, according to its size and vigor, is sufficient for the second season; the third year it should produce about ten pounds of grapes, and the fourth, double that number. Twenty pounds per vine is considered an average crop, but it is recorded of a famous Concord vine that it bore each year at least ten bushels. Such a yield is, of course, exceptional. Grapes bring varying prices, according to quality, variety, season, etc. Choice California grapes cost from thirty to forty cents a pound in the winter. The popular Concord grape may be purchased in the summer season for about twenty-five cents a basket.

One of the secrets of successful grape culture is to make sure that the grapes are grown on shoots of that season's growth. At the beginning of every winter all branches and shoots must be cut back to from two to five buds. A vineyard in winter appears like a barren waste of land almost covered with stumps.



COMPOSITION OF GRAPES

Figures indicate percentages. The heat-producing value of grapes is 435 calories per pound, therefore about equal to very lean round steak, brook trout, green corn and boiled potatoes. Their fuel value is thus seen to be not high.

Vines need good, well-drained, warm soil and a climate that is free from early fall and late spring frosts. European vines, grown in the open, stand alone, but the American varieties need supports. The shoots are usually either

tied to, or trained over, wires. The grape cuttings introduced from Europe into America have proved successful on the Pacific coast. The grapes grown in the Eastern and Central states are of native origin, the result of careful selection and training.

BLACK ROT

A cluster of Niagara grapes of which half have black rot. Some of those affected have dried down to mummies.

Enemies of Grapes. The most dangerous enemy of the vine is the animal parasite called *phylloxera,* whose attacks caused great destruction among the vineyards of Europe year after year. It appeared in England in 1863 and in France a little later. It was soon discovered that American vines were able to resist this parasite, and now most of the vineyards of Europe contain vines grafted with American stock (see PHYLLOXERA).

The two most common diseases of the grape grown in the United States and Canada are *downy mildew* and *black rot.* The downy mildew is caused by a fungus growth and appears on the leaves and fruit in the form of purplish stains, the stained parts quickly rotting and affecting the whole vine. Black rot attacks the leaves, dark brown stains appearing as the first signs. From the leaves the disease spreads to the fruit, which turns black, withers and dies. For these and all similar diseases the best prevention is thorough spraying of the vine with Bordeaux mixture.

Uses of the Grape. The first use of grapes was naturally as a fresh fruit, the flavor and nourishing qualities, due to the large quantity of sugar contained, rendering them superior to other fruits known in olden days. Then came the juice of the grape, drunk directly as squeezed from the fruit, or after it had been fermented and turned into wine. Dried grapes, or raisins, early became a staple article of food and among the Greeks the grapes of Corinth, now called *currants,* formed practically the only food of the athletes. In modern households raisins and currants appear daily in cakes, puddings, pies, jams and jellies; and grape juice, a refreshing, nourishing drink made of the unfermented juice of the fruit, is highly esteemed throughout the world.

Grapevines as Decorations. The grapevine, properly trained, affords perfect shade, and is able to transform the most bare and unsightly buildings into things of beauty. In all towns and villages there are houses on which the sun shines from the east, west and south, blistering paint and in summer rendering them almost uninhabitable. Grapevines would turn the sunshine into fruit and foliage, save money and materially add to the health of the home. Arbors and pergolas draped with vines add to the beauty of parks and gardens, and, with little care and outlay, the grape will turn dreary places into beauty spots. F.ST.A.

Consult *Farmer's Bulletin 30,* United States Department of Agriculture, "Grape Diseases;" Duggar's *Fungous Diseases of Plants.*

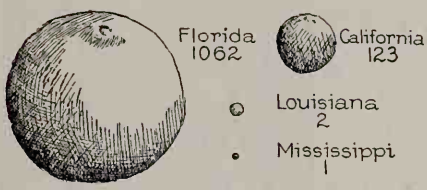
GRAPE'FRUIT, a citrus fruit, allied to the lemon and orange, and called *grapefruit* because the fruit grows in clusters like bunches of grapes. The tree grows to a height of from twenty-five to thirty feet; the fruit is

HOW GRAPEFRUIT GROWS

four to seven inches in diameter and weighs from one to twelve pounds. The pulp resembles that of the orange, except that it is coarser, and the juice is sour and a little bitter. Its acidity has been greatly reduced by grafting and crossbreeding. It is usually eaten with sugar, although some people prefer it without.

It became popular as a breakfast fruit practically since 1900, and the increased demand has led to extensive growth. It sharpens the appetite, which is its real food value. The pomelo variety is now grown to the extent of over 1,190,000 boxes annually in Florida and California, with an annual value of over $2,000,000 to the growers. About ninety per cent are produced in Florida, and ten per cent in California.

The grapefruit originated in the Malayan and Polynesian islands. It has been extensively cultivated in India, Florida and California, and in most tropical and subtropical countries. The round-fruited sorts are called



Figures Represent Thousands of Boxes

PRODUCTION CHART

Average yield each year, as reported by the United States Census Bureau.

pomelos, or grapefruit, and are the most valuable commercially. The pear-shaped fruits are called *shaddocks,* after Captain Shaddock, who found them in the East Indies and introduced them into England in 1810. The shaddock is so acid that it is not edible; it is cultivated more as a curiosity and is seldom found in the markets. The natives in the West Indies and other regions use the juice of the shaddock for scrubbing floors, because it drives away insects.

S.L.A.

GRAPHITE, *graf'ite,* the mineral used for the "lead" in lead pencils. It is of an iron black or dark gray color, has a luster, and is found in masses which are composed of minute scales crowded together. It is very soft and brittle

Figures Represent Thousands of Tons

PRODUCTION CHART

Comparing lead pencils of different sizes we indicate clearly the annual production of graphite from the principal countries. In addition to the countries named, Chosen (Korea) mines an unknown quantity, of which the United States imported 6,327 tons in 1915.

and is easily reduced to a fine powder, though the grains are very hard. It has a soapy touch, but will leave its mark on almost any substance it touches; this characteristic makes it valuable for pencils.

Graphite is found in pockets in the older crystalline rocks. It was formed from plants in the same manner as coal, though with the graphite the process was carried further. Next to the diamond, graphite is the purest form of carbon. Here we find one of the wonders of nature—the brilliant, sparkling diamond, the hardest known substance, and the black, crumbling, greasy graphite, the softest known mineral ore, are merely different forms of the chemical element, carbon. Graphite is mined and prepared for the market by grinding and then purifying in settling tanks. Its chief uses are in the manufacture of lead pencils, for lubricating machinery and for making crucibles. For the last purpose it is mixed with clay, which fuses with the graphite and forms a crucible that will not melt under the most intense heat. See PENCIL; CARBON.

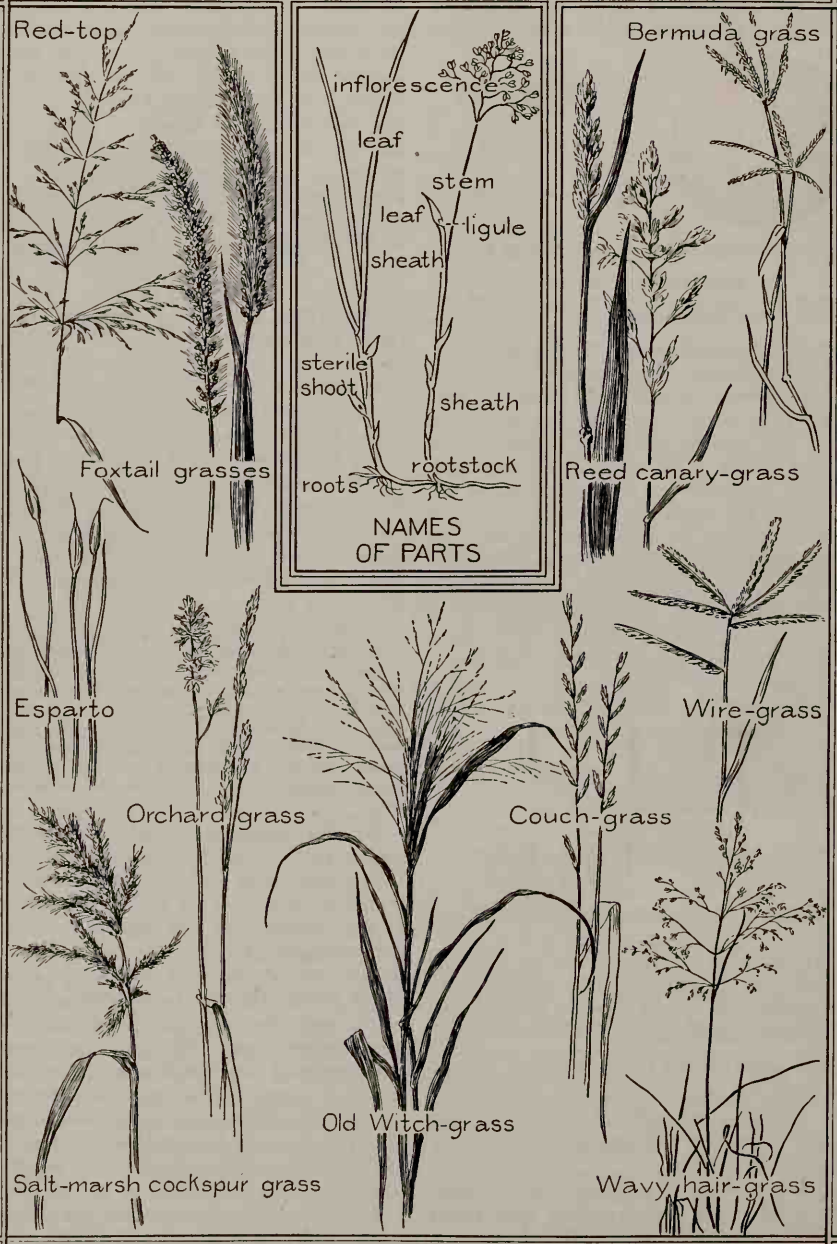
GRASS'ES, a family of plants remarkable for its wide distribution and variety of forms, and outranking all other families of the vegetable kingdom in point of usefulness to man. In the tropics the grass family is represented by the giant bamboos, that tower one hundred feet or more toward the sky; far to the North, mosslike grasses a few inches high struggle for an existence in the hard bosom of the frozen earth; and in the temperate regions the larger grasses clothe with a beautiful garment of green the meadows, lawns and hillsides. Says a botanical writer:

> Grasses there are, stout and higher than one's head, and grasses so slender that their dying stems among wayside weeds are like threads of gold; grasses whose panicles of bloom are more than half a yard in length, and of a color which only a midsummer sun can burn into August fields; grasses so stiff that winter's snow leaves them unbroken, and grasses so tiny that their highest flower is raised but a few inches from the soil.

The great grass family contains about 4,700 species, nearly 1,000 of which are found in the United States and Canada. The majority of grasses are herbs, but the treelike species, such as the bamboos, have woody stems. From the standpoint of utility, the bamboo (which see) is one of the most remarkable of the plants which man has found adapted to his needs, and there are many other grasses of great economic value. Esparto, a tough, coarse grass imported from Spain and North Africa, is used to a considerable extent in paper making and for stuffing mattresses. Sugar cane, also a member of the grass family, furnishes the world with about one-third of its supply of sugar.

Then there are the meadow and pasture grasses, valuable as a source of food for farm

SOME OF THE WILD GRASSES



animals. Among the principal pasture grasses are red-top, blue grass, bent grass, blue stem and Bermuda grass; the hay grasses include red-top, blue grass, timothy, orchard grass, meadow foxtail, tall oat grass and rye grass. Cereal grasses, represented chiefly by wheat, corn, oats, rye, barley and rice, provide man with the most important part of his vegetable food.

Grasses are flowering plants which produce flowers extremely complex in structure, and characterized by richness and variety of coloring. All grasses have fibrous roots and nearly all have hollow, jointed stems. According to arrangement on the stem, the leaves are said to be two-ranked; that is, each alternate leaf grows on the opposite side of the stem from the one before it, which brings the third one directly above the first and the fourth above the second. The various species grow in every variety of situation—in dry, barren places, in moist, rich soil, in marshes, in stagnant water, on inland prairies and along the seacoast. B.M.W.

Related Subjects. The reader who wishes to gain an appreciation of the economic importance of the various members of the grass family is referred to the following articles in these volumes:

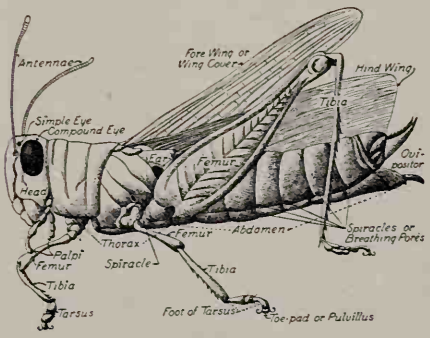
Bamboo	Millet
Barley	Oats
Blue Grass	Popcorn
Broom Corn	Rice
Cane	Rye
Corn	Sorghum
Couch Grass	Sudan Grass
Esparto	Sugar Cane
Foxtail Grass	Sweet Flag
Gama Grass	Timothy
Kafir Corn	Wheat
Maize	Wild Barley

GRASS'HOPPER, the popular name for two families of straight-winged, leaping insects, which hop through fields or along dusty roadsides the summer long. One species is described by Leigh Hunt, in *To the Grasshopper and the Cricket,* as—

> Green little vaulter in the sunny grass,
> Catching your heart up at the feel of June,
> Sole voice that's heard amidst the lazy noon,
> When even the bees lag at the summoning brass.

All are characterized by long, slender legs with large thighs adapted for jumping; by mouth-parts fitted for biting; and by large, delicate hind wings with strong powers of flight, protected, when at rest, by thickened, tough fore wings which extend far beyond the end of the abdomen. The males produce a chirping sound by rubbing their wing covers together, the sound varying according to the species. The chief differences are in coloring, habits and length of feelers, or horns.

Strange as it may seem, grasshoppers, with which should be included locusts, are used as food in some parts of the world. In desert and semiarid sections of Arabia and in the North African plains near the Red Sea they are eaten



PARTS OF THE GRASSHOPPER

by some tribes of native Arabs. The usual method of preparing them is by drying the insects thoroughly, then crushing the bodies in a mortar and making them into meal by adding water and sometimes a little syrup. The Indians of North America, particularly on the Great Plains, were once known to roast grasshoppers, and thus prepare them as a food delicacy.

Life History. Grasshoppers lay their eggs beneath the surface of the ground, commencing late in July. The female pierces a hole in the ground with her sharply-pointed abdomen and lays from twenty-four to thirty-six eggs, each one-fifth of an inch long. These are covered with a varnishlike film, and the mass then looks like a curved pod. Two of these pods are usually deposited by each female during her life. In the spring the eggs hatch into wingless creatures. Within eighty or ninety days, after shedding their skins, or *molting,* four or five times, the young are full-grown, with completely developed wings. In another week the insects mate, lay the eggs for another generation, and within three or four weeks shrivel up, wither and die.

Short-horned Grasshopper, or True Locust. Although commonly known as a grasshopper, this destructive species is a true locust; those insects which in America are called locusts are really *cicadas* (which see). To this species belong the *Rocky Mountain grasshopper,* which

in the years of 1874-1876 damaged several hundred millions of dollars worth of grain crops in Western United States, a similar species having also destroyed crops in Russia, Southern Europe and other countries; the *red-legged grasshopper,* common in Eastern America, having shorter wings than the western species; the light brown *Carolina locust* and the *American locust* of Southern United States. See LOCUST.

Long-horned Grasshopper. To this species, more delicate than the short-horned grasshoppers, belong the slender, green, harmless meadow grasshoppers, the dark-colored, wingless *cricketlike grasshoppers* or *cave crickets,* the *sand crickets,* and the interesting *katydids* (which see).

Grasshoppers furnish a large proportion of the food for many varieties of birds. M.S.

Consult Howard's *The Insect Book;* Kellogg's *American Insects.*

GRATTAN, *grat'an,* HENRY (1746-1820), an Irish politician and orator who, for his services to his country, was voted $250,000 and "a house and lands for him and his heirs forever" by the Irish Parliament. He was born in Dublin, was educated at Trinity College in Dublin, and in 1772 was admitted to the Irish bar. In 1775 he was elected as representative of Charlemont to the Irish Parliament, into which he infused such a spirit that mainly to him was due the partial abolishment of the heavy restrictions on Irish commerce. For his services in obtaining this great concession he was voted the gift above named. He became the head of the Irish Whig party and temporarily withdrew from Parliament, but returned in 1805 as representative for Malton and in 1806 for Dublin. His later years were spent in working for Roman Catholic emancipation. He did not have a strong voice, yet he ranked high as an orator. His invective against Bonaparte and his eulogy on Chatham are not surpassed in British eloquence. He died in London, and is buried in Westminster Abbey.

GRATZ, or **GRAZ,** *grahtz,* the capital of the Austrian province of Styria, 140 miles southwest of Vienna. It is beautifully situated in a broad and fertile valley on both banks of the Mur. On the Schlossberg, a hill 1,545 feet high commanding a fine view of the city, formerly stood the citadel and fortifications, which have been demolished to make room for pleasure grounds. The cathedral is a notable building dating from the fifteenth century. The city has excellent railroad facilities and conducts a large trade in iron and steel goods, paper, woolen, cotton and silk goods, chemicals and leather. Gratz is also noted for its lithographic and printing establishments. It is one of Europe's most ancient cities but nothing is known of its history previous to the year A.D. 881. Population in 1910, 151,781.

GRAVITATION, *grav i ta'shun.* If you hold an iron ball or a stone or some similar object in your hand you will feel a power constantly drawing it towards the ground. It is as though something were trying to pull it out of your hand. And this is precisely true. Something *is* trying to pull it out of your hand. It is that force which we call *gravitation* which is pulling on the ball, trying to draw it back to the earth. Every particle of matter in the universe attracts every other particle of matter. Gravitation is the general term given to this attraction wherever it exists—and it exists everywhere. It is the force which holds the universe together.

The attraction that keeps the moon revolving around the earth is gravitation. The force that keeps the earth and other planets revolving around the sun is gravitation. The force that keeps all the stars of the heavens in their places is gravitation. Gravitation is the force that holds bodies close to the earth's surface instead of permitting them to fly off into space.

No matter how large or how small any given bodies are, the force of gravitation is acting between them. A stone falls to the ground because the earth attracts it; but the stone in turn attracts the earth. Each moves to meet the other, but the stone passes through a much greater distance than does the earth, simply because it is so much smaller. As a matter of fact, the mass of the earth is so great that its motion is imperceptible with relation to any small object; but, put it within close range of a mass as large as the sun and it would be drawn to the surface of that object just as a stone is drawn to its surface.

The law of gravitation was discovered and formulated by a famous English mathematician named Sir Isaac Newton. Tradition has it that Newton, as he sat in his beautiful garden at Wollsthorpe one afternoon in the fall of 1665, saw an apple fall to the ground and this suggested a great truth to him. He began to inquire of himself why it was that the apple had fallen, and from this, as a beginning, he formulated the laws of gravitation.

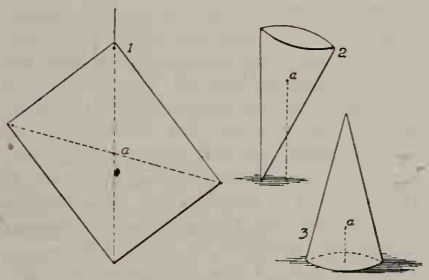
But when he tried to apply them he used figures for the various dimensions of the earth which were afterwards found to be wrong, and so, at first, he could not prove his law.

The general law of gravitation formulated by Newton is that every particle of matter in the universe attracts every other particle of matter in the universe with a force that is directly proportional to its bulk, or mass, and inversely proportional to the square of the distance between them. C.R.M.

Related Subjects. The reader is referred to the following articles in these volumes:

Earth	Mass
Falling Bodies	Newton, Sir Isaac
Gravity, Center of	Weight

GRAVITY, *grav'i ti,* CENTER OF. If you stick a pin through a point near the edge of a blotter and allow the latter to swing freely, it will come to rest at a position in which most of the blotter is below the point of suspension; if you move it, it will return always to this same position. There is one point in the blotter, however, called the center of gravity, or center of weight; if you stick the pin through this, the blotter will remain in whatever position you place it. How to find this center of gravity is shown at (1) in the illustration.

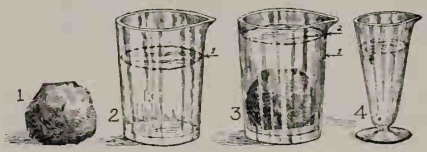


CENTER OF GRAVITY

When the force of gravity acts on an object it does so as if its power were all applied at the center of gravity. When a cone is in the position shown at (2), so that a line directly downward from the center falls outside of the object, the pull of gravity will upset the cone by drawing the center toward the earth. But in the position at (3), where a similar line falls within the base of the cone, gravity merely holds the article still, because to tip it in either direction the center must be raised. In the first case it is said to be in *unstable equilibrium,* in the second in *stable equilibrium.* Everyone knows that a board standing on end will fall, that one on its edge may be balanced but is easily overturned, but that a board resting on its broad side will stay in that position. From this it may be seen that the higher the center of gravity of an object, the more liable the object is to tip.

A center of gravity may be outside of its object, as in the case of anything hollow, like a boat or a dish. The point at which the attraction of the sun influences the earth is not the center of the earth, but the center of gravity of the earth and the moon combined, for although they do not form a single object, their mutual attraction makes it impossible for the sun to pull on one without pulling on the other and they are like a dumb-bell with one large and one small end.

GRAVITY, SPECIFIC. There was consternation at the court of Syracuse one day many hundreds of years ago when Hiero, the king, on receiving a new crown, decided that it was not made of solid gold, as he had ordered, but was alloyed with silver. He was furious! A king's crown has to be of purest gold. Besides, he did not intend to be cheated. But his problem was simple; he merely sent the crown to Archimedes with the command that he settle the matter.



AN EXPERIMENT IN FINDING SPECIFIC GRAVITY

Figure 1 is a stone. If it is immersed in water in Figure 2 it will raise the water in the tumbler as much as the space it occupies; that is, speaking scientifically, it will displace its own bulk of water. Figure 3 indicates the increase in the height of water. Figure 4 represents the water which equals the bulk of the stone. When that quantity of water and the stone are weighed it can be determined how many times heavier than water is the stone. The resulting quotient is the *specific gravity* of the stone.

Archimedes was one of the wisest men in Greece in the period about 200 years B.C. In the article under his name you will find an account of his life and the marvelous things he did. But Archimedes, for all his wisdom, was much puzzled by the problem presented to him. For a long time he was unable to devise a way of finding out whether the king's crown was actually made of pure gold, without destroying it. Then, one day, when he was getting into the bath, he noticed the spilling over of the water and it gave him his

inspiration. He would take the crown and put it into a vessel filled with water and note how much spilled over. Then he would take the same weight of pure gold and put it into a vessel containing exactly the same amount of water. If the crown were also of pure gold it would be exactly equal in bulk to the piece of gold and the amount of water displaced would be exactly the same in both cases. But if the gold in the crown were mixed with silver, it would be greater in bulk than the piece of pure gold, and the amount of water spilled over would show it. In short, Archimedes had discovered how to determine the *specific gravity* of a substance.

Specific gravity is the heaviness of a given quantity of a substance as compared with that of an equal quantity of another substance used as a standard. Water is usually taken as the standard of comparison for solids and liquids, while air is taken as the standard for gases. The specific gravity of a solid or liquid is the ratio between its weight in air and the weight of an equal volume of water; this ratio is secured by dividing its weight in air by the weight of an equal volume of water.

Archimedes' principle, that a body immersed in a fluid displaces an amount of the fluid equal to its own loss of weight, furnishes the most convenient method of finding the specific gravity of a substance. First weigh the substance in air; then weigh it in water; then subtract the weight in water from the weight in air. The result will be the weight of the volume of water displaced. Divide the weight of the substance in air by its loss of weight in water and you will have the specific gravity of that substance.

A piece of brass is found to weigh seventeen pounds in air and fifteen pounds when immersed in water. Fifteen from seventeen leaves two (the weight of an equal volume of water). Seventeen divided by two equals 8.5; therefore, 8.5 is the specific gravity of brass.

To find the specific gravity of a body lighter than water, weigh the body in air. Then take a sinker heavy enough to keep the body under water, and weigh the sinker in the air and in the water. Then weigh both the body and the sinker in water. By subtracting the loss of weight of the sinker in water from the loss of weight of the two bodies together, the loss of weight of the light body is obtained. Divide the weight of the light body by its loss of weight in water and the result is its specific gravity, which will, of course, be less than 1.

A block of wood weighs 12 ounces in the air, and a sinker 30 ounces. Together they weigh 42 ounces. The sinker weighs 25 ounces in water, the two together weigh 7 ounces in water. Subtract 7 (the weight of the two in water) from 42 (the weight of the two in air), and the remainder is 35 (ounces), the loss of weight of the two objects in water. From 35 subtract 5 (the loss of weight of the sinker in water), and the remainder is 30 ounces, the loss of weight of the body in water. Divide 12 (weight of body in air) by 30, and the quotient is 0.4, the specific gravity of the piece of wood.

In finding the specific gravity of a liquid, a specific gravity bottle is commonly used. This bottle is made to hold a certain weight of water, say a thousand grains. Fill the bottle with the liquid to be tested and weigh it. Divide the weight of the liquid in the bottle by the weight of water it is made to contain (1,000 grains), and the result is the specific gravity of the liquid. The specific gravity of a liquid may also be found by the use of a hydrometer (which see). C.R.M.

GRAY, Asa (1810-1888), recognized as the foremost American botanist of his day, was born at Paris Furnace, N. Y. After a few years spent in the practice of medicine he became curator of the New York Lyceum of Natural History. In 1838 he was appointed professor of natural history in the University of Michigan, and in 1842 accepted a like appointment at Harvard College. As the leading disciple of Darwin in the United States, he advocated and defended the theory of evolution as being in harmony with the strictest religious views. The collection of his brilliant discussions on the subject is entitled *Darwinia.* Professor Gray's writings include many valuable textbooks on American flora, some of which are *Field, Forest and Garden Botany; How Plants Behave; New Flora of North America,* etc. No other botanical textbooks than Gray's were used for years in the high schools of America. See Darwin, Charles.

GRAY, Elisha (1835-1901), an American inventor for whom his friends claimed the honor of invention of the telephone, denying the credit to Alexander Graham Bell. He was born at Barnesville, Ohio, and attended Oberlin College, maintaining himself there by working as a carpenter. Beginning his investigations in 1867, he took out nearly fifty patents for telegraph, telephone and other electrical appliances, including a type-printing and a writing or copying telegraph. In 1876 he filed in the Patent Office specifications for a telephone, but the patent was finally awarded to Alex-

ander Graham Bell (which see). Mr. Gray was for a number of years engaged in the manufacture of telegraph apparatus in Chicago and Cleveland. He was the author of *Harmonic Telegraphy and Telephony* and *Nature's Miracles.*

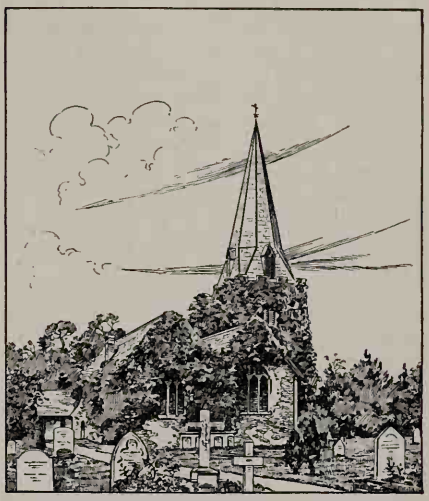
GRAY, GEORGE (1840-), an American jurist and legislator, who rendered his country distinguished service as member of such important arbitration boards as the Joint-High Commission between Canada and the United States (1898), the Anthracite Coal Strike Commission (1902), of which he was chairman, and the North Atlantic Coast Fisheries Arbitration of The Hague (1910). He was born at New Castle, Del., was graduated at Princeton College in 1859, and after studying law at Harvard was admitted to the bar in 1863. From 1879 to 1885 he was attorney-general of Delaware, being elected in the latter year to the United States Senate. In the Senate, where he served twelve years, he was one of President Cleveland's most loyal supporters at times when the President's quarrels with Congress reached the acute stage. He was appointed judge of the United States Circuit Court in 1899 and served until his resignation in 1914. Under the Hague Convention of 1900 Judge Gray was made a member of the International Permanent Court of Arbitration.

GRAY, THOMAS (1716-1771), an English poet, author of one of the best-known and also one of the most perfect poems in English literature, *Elegy Written in a Country Churchyard.* In the opening lines of this beautiful poem, Gray revealed himself as herald of the new movement in English literature that came to full flower in the first part of the nineteenth century (see ROMANTICISM):

> The curfew tolls the knell of parting day;
> The lowing herd winds slowly o'er the lea;
> The plowman homeward plods his weary way,
> And leaves the world to darkness and to me.

He was born in Cornhill, London, and studied at Eton College and at Cambridge University. He left the university without taking a degree, and from 1739 to 1741 traveled on the continent with his friend Horace Walpole, son of England's Prime Minister. Returning to England, he resumed his studies at the university, receiving a degree in 1743. He passed nearly all the rest of his life in Cambridge, devoted to writing and the study of literature.

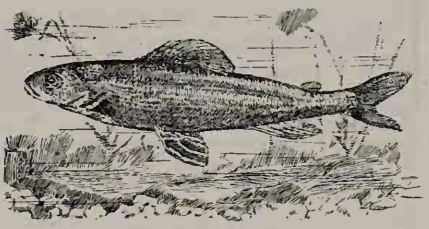
The publication of his *Elegy,* in 1750, established his fame, and in 1757 he was offered the poet laureateship, which he declined (see POET LAUREATE). The same year appeared his odes, *The Progress of Poesy* and *The Bard.*



THE "CHURCHYARD" OF THE "ELEGY"
The place has changed but little in appearance since the poet's death. Beneath the window rich with ivy is the grave of Gray—an ideal resting place for one who has identified his name forever with its peaceful beauty.

The latter, a thrilling denunciation of the cruel King Edward, uttered by the last of the Welsh bards, is so filled with the spirit of Romanticism that it is justly considered one of the epoch-making poems of English literature. Then followed *The Fatal Sisters* and *The Descent of Odin,* which helped to bring the literary world to a realization of the romantic beauty of Norse mythology. Gray was also an admirable letter writer, and he composed very good Latin verse.

GRAY'LING, "the flower of fishes," so called by Saint Ambrose, the Bishop of Milan. This



THE GRAYLING

family contains only five species, all of which are very beautiful and live in the rivers of cool or Arctic regions. In Europe they reach

a weight of four or five pounds, but in America the specimens rarely exceed one and one-half pounds. They are much like the small salmon in character and habits, but are more slender, graceful and active. They differ especially in the structure of the skull, for the head is short, the mouth small and the eyes very prominent, while their scales and dorsal fin are much larger. The three American species, Arctic, Michigan and Montana, which are about eighteen inches in length, are fine game fish and their flesh is a great delicacy. The American grayling is not widely distributed, for it is found only in the geographical sections which give the names to the three species.

GREAT AUSTRALIAN BIGHT, *aws tra' li an bite,* a bay of the Indian Ocean indenting the south coast of the continent of Australia. Its boundaries are not clearly defined, but it extends almost the entire length of the coast, sweeping northward from Tasmania along the coasts of Victoria and South Australia, to the most southerly point of West Australia. Numerous bays and gulfs indent the shores of Victoria and South Australia, but on the south of West Australia there are few bays and no natural harbors of any importance. The only large river flowing into the bight is the Murray, which carries with it the waters of the Darling and other tributaries.

GREAT BEAR LAKE, a large lake in the basin of the Mackenzie River, in Northwest Canada, so called because it lies partly within the Arctic Circle, beneath the constellation Great Bear. It is about 250 miles east of the Rocky Mountains, on low-lying land, the bottom of the lake being below the level of the Arctic Ocean. It has a very irregular outline and covers an area of 11,821 square miles, making it nearly as large as the state of Maryland, and more than one-half as large as the province of Nova Scotia. The water is very deep, and singularly clear and cold. Fish of many kinds abound, especially the herring-salmon. For more than half the year the lake

LOCATION MAP

is frozen. Fur-bearing animals are trapped in great numbers along its shores. The lake is fed by numerous rivers, the most important being the Dease, and is drained by the Great Bear River, which flows into the Mackenzie. In 1825 the second expedition of Sir John Franklin wintered on the shores of the lake and erected a fort named Fort Franklin, which was afterwards occupied as a trading post of the Hudson's Bay Company.

GREAT BRITAIN, *brit''n,* the largest island of Europe, and the most important island in the world. This "right little, tight little island," as its inhabitants affectionately call it, has acquired through the centuries an influence which reaches around the world. It is impossible even to imagine what the history of North America, of South Africa, of India, of Egypt would have been had it not been for the part in their history that has been taken by Great Britain.

What the Name Means. The name, in its Latin form, *Britannia Major,* is an old one, used to distinguish the island, dimly visible

across the channel, from Britanny, or *Britannia Minor,* in France. Politically it had no significance until the accession in 1603 of James I, who wanted some title to indicate his entire English and Scottish realm. As officially used, the name Great Britain includes England, Scotland and Wales, but popularly the term has a wider meaning, including Ireland as well, or even, by a still greater extension, designating the entire world-encircling British Empire. In this article, geographical treatment will be confined to the island itself, but in the discussion of government the whole empire will be considered. To gain a full and detailed knowledge of the United Kingdom, with its people, its industries, and its geographic features, it is necessary to read not only this article, but those on ENGLAND, IRELAND, SCOTLAND and WALES, as well.

Size and Location. Among the islands of the world Great Britain ranks sixth in size, the largest island, New Guinea, if Australia be excluded, having an area three and one-half times as large as Great Britain's 88,094 square miles. Great Britain is thus nearly twice as large as Pennsylvania, or about one-third as large as the Canadian province of Alberta. Of its area, England constitutes 50,867, Scotland 29,785, and Wales 7,442 square miles. Its greatest length is almost 600 miles, or two-thirds of the distance between New York and Chicago; its greatest breadth is in the extreme south, about 320 miles, while between the Firth of Forth and the Firth of Clyde it narrows to thirty-two miles.

Great Britain lies in the northwest of Europe, just north of France, and is separated from the Continent by the North Sea, the Strait of Dover and the English Channel. To the west, and separated from it by North Channel, the Irish Sea and Saint George's Channel, is another large island, Ireland, which at all times in its history has been closely associated with Great Britain, while all about it are groups of smaller islands, the Orkney, Shetland, Hebrides, Scilly and Channel Islands, and the Isles of Wight, Man and Anglesey, which are under its domination.

Its shape and location have given to Great Britain certain advantages which it has utilized to the full. First of all it has, by reason of its broken shore line and many deep indentations, a very long coast in proportion to its area—over 4,000 miles in all, or one mile to every twenty square miles of area. The vast continent of Africa, with its eleven million square miles and more, has but a little over four times as long a coast line. Because of this peculiarity, Great Britain has no point which is over seventy miles from the sea. Navigable rivers, too, decidedly enhance this advantage.

Then there is its location, in the temperate zone, but far enough north so that its northernmost points, where the summers are short, have a compensating length of day—seventeen hours of daylight in some places. Moisture is plentiful, too, because of the proximity of the warm waters of the Atlantic, and not only agriculture, but certain manufacturing industries as well, profit from this. Close to the great countries of Western Europe as it is, it has never lacked for markets to which to send its products, while the fact that it lies right between the great land masses of the globe has had much to do with its commercial importance. As noted in the article on England, however, these advantages would have gone for naught had the inhabitants of the island not been the progressive, able people that they are (see subheads *The People* in articles ENGLAND; SCOTLAND; WALES).

Physical Characteristics. Though the details of the surface features are given in the articles on the separate political divisions, a brief summary of them as they concern the island as a whole will be of interest here.

As regards elevation, Great Britain has four definite, well-marked regions.

(1) The *Highlands* of Northern Scotland, a rather barren, inhospitable mountain district, which contains among its ridges Ben Nevis, the highest point in the island, which reaches an altitude of 4,406 feet. In this section have developed those silent, rugged people who have preserved for so long their own peculiar customs and dress—the Scotch Highlanders.

(2) The Scottish *Lowlands*, south and east of the mountain region—an agricultural district with rich soil and with mineral wealth which has made possible thriving manufacturing industries. The Lowlands are much more thickly populated than the Highlands.

(3) The mountainous region which extends from Southern Scotland across Northwestern England and embraces practically all of Wales. One range of these mountains, the Cheviot Hills, forms a portion of the boundary between England and Scotland. These mountains are not so high as those of the Scottish highlands, nowhere attaining a greater height than 2,600 feet.

(4) The lowlands of England, to the south and east of the mountain district, the greatest agricultural region of the island.

Mineral Wealth. This, with the various industries, is treated in the separate articles, but

it is worthy of special note here. No other country in all the world has produced anything like so large a total of minerals. To-day, to be sure, the United States far exceeds Great Britain in its coal production, but less than a century ago Great Britain mined each year two and one-half times as much coal as all the rest of the world together, and three-quarters of a century ago it was producing more than half the world's output of iron. The amount of coal produced in the island is constantly increasing, but iron production seems at a standstill, and larger and larger quantities are being imported. If all the people who work in the coal mines of Great Britain could be brought together they would constitute a city larger than any in the island except London, for there are no fewer than 800,000 of them.

Manufactures. The history of the growth of manufactures in Great Britain has been one of absorbing interest. In early times the people of Holland, of France and of Flanders far surpassed the English in industrial skill and in the amount of manufactured products, and not until after the union of England and Scotland did British supremacy in manufacturing really begin. There were many causes which contributed to this—the abundance of iron and coal, as noted in the article ENGLAND; the growing commerce of the country, which made possible easy distribution, and the peculiar British inventive genius which gave to the country its labor-saving machines. It was in connection with the installation of machinery in the various factories that there occurred some of the most interesting events in all industrial history. Fear lest machinery would take from them their means of livelihood united with superstition to make the factory people hate the machines, and seldom was one set up without a riot. An excellent idea of this turbulent condition is given in *John Halifax, Gentleman,* which describes the difficulties its hero met in trying to introduce machinery.

For over a century after the factories were reorganized on the new mechanical basis, Great Britain produced more manufactured articles than any other country in the world, but in the latter part of the nineteenth century the United States had a very remarkable industrial development and menaced, if it did not quite take away, Great Britain's supremacy.

Transportation and Communication. Great Britain has, for its size, a large number of navigable rivers, and before the invention of railway transportation much was done to improve these. The country was crossed and recrossed by a network of canals, but since the coming of the railroads these have been in a large measure neglected. Certain of them, as

COMPARATIVE AREAS

England, Scotland, Wales and Ireland have a combined area of 121,331 square miles—less than 4,000 square miles greater in extent than the three states of Ohio, Indiana and Kentucky. Nevertheless, Britain's power is almost without limits.

the Manchester Ship Canal (which see), however, which is wide enough to admit of the passage of two huge seagoing vessels, are still of great importance. The roads are excellent, and while the old coaching days with their changes of horses at the wayside taverns are over, the highways have been a great boon to automobilists.

The railroads are the island's chief means of transportation, and Great Britain has the honor of having possessed the first railway of any importance, that which was opened in 1830 and ran from Liverpool to Manchester. Railroads increased rapidly and to-day the island has over 20,000 miles of track. Street railways are not nearly so numerous or so important as in the United States, there being in all less than 3,000 miles.

The outbreak of the War of the Nations in 1914 had a great influence on the railroads of Great Britain. Most of these were immediately taken over by the government, and though the general managers were left in control, they were made responsible to the government rather than to the stockholders. The prime consideration demanded was prompt and effective movement of troops, food and muni-

tions; and ordinary traffic was compelled to take a second place. The railroad employees showed great promptness in enlisting for military service, and one road, the North Eastern, sent so many volunteers that these were formed into a separate battalion.

Great Britain has excellent telegraph and postal systems, both of which are owned and controlled by the government. The income of the postal service is greater than its expenditure, but the telegraph service is carried on at a slight yearly loss.

Commerce. In treating this subject it must be kept in mind that it is in this aspect of its industrial life that Great Britain suffered most severely from the War of the Nations. That struggle broke in sharply upon the commercial supremacy of Great Britain, but just what its permanent effects will be, it is impossible to predict. Figures given below have reference to conditions just previous to the outbreak of the war.

Expansion of trade has been at the basis of Great Britain's desire for colonial expansion; protection of trade has been the incentive for its constant insistence upon naval supremacy, and from the time of Queen Elizabeth British commerce has been steadily growing. The British merchant marine is the largest in the world, and for many years has carried not only the commerce of Great Britain and its colonies, but much of that of other nations as well, including the United States. The imports have increased in value more rapidly than the exports, for certain manufacturing industries which once were carried on almost exclusively in Great Britain have been developed on the Continent as well, and in the United States and Canada. In the years just before the War of the Nations the total imports amounted to more than $3,843,000,000, while the exports were approximately $2,506,000,000, exclusive of imports reëxported. Practically all of the exports are manufactured articles and coal, while the imports are largely foodstuffs and raw materials. Of the countries engaged in trade with Great Britain, the United States is the largest furnisher of imports, Germany, British India, France and Argentina ranking next, in that order; while British India, Germany and Australia receive the heaviest exports in normal years.

Religion. Closely associated as they are, England and Scotland differ in their dominant religion (see ENGLAND and SCOTLAND, subheads *Religion*). In England the established church is the Church of England, while in Scotland the Presbyterian Church is strongest. It is an interesting fact that the Presbyterians who originated in Scotland and have there had their stronghold ever since are in England one of the least numerous of the dissenting sects.

The British Empire

Great Britain is but the nucleus of the British Empire—the largest empire in the world, with possessions on every continent and in every clime. "The sun never sets on British soil" is the Englishman's proud boast, and it is literally true. Nearly one-fourth of the land surface of the globe is included in this Empire, which has a total area of about 12,000,000 square miles, while the total population is estimated at more than 422,076,000.

The contrasts presented by the various parts of this vast, scattered empire are very sharp. There are great fertile sweeps, and there are desert stretches where none but the nomad can live (see NOMAD LIFE). There are great rivers, high mountains, large lakes, and there are other stretches of unvarying monotony, with neither mountain nor water to lend attractiveness. Some of the dwellers under the British flag are among the most intellectual, highly developed people in the world; others are rude, primitive peoples but little removed from savagery. Varied methods are necessary for dealing with these differing possessions, and several of these have been brought to a high state of development. In certain territories, known as *protectorates*, the native government continues in force, British representatives having merely advisory power. Most of the African possessions, as Nyasaland, Nigeria and Uganda, are of this rank.

Other territories are called *colonies*, and are governed by officials appointed by the British Crown. Of such colonies there are two classes —the self-governing, as Canada and the Commonwealth of Australia, in which the ministers are responsible to the colonial legislature, and only the Governor-General is under the control of the home government; and the *crown* colonies, so-called, the officials of which are directly controlled by the British department of state for colonies. In the following list, which contains the chief colonial possessions, with their area and population, no attempt is

made to distinguish between these different classes, but in the articles under the separate titles their standing will be indicated. Some of the subject territories have no census, and their population is merely estimated; and the total here given is not absolute, for colonies of minor importance have been omitted:

certain advantages in Africa, but whether or not the gain there is permanent, only the results of the war can tell.

The totals given are below rather than above the actual numbers, for all estimates are conservative, and in the population figures of many places the army and navy are not included.

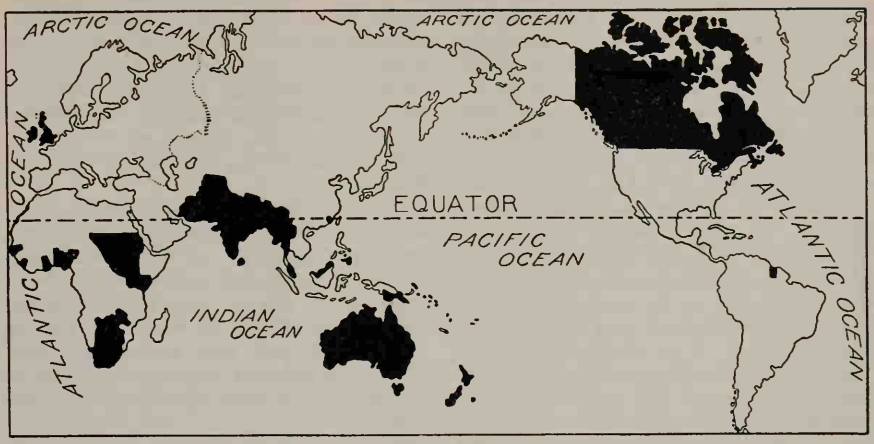
Colonial Possessions of Great Britain

LOCATION	AREA IN SQUARE MILES	POPULATION
In Europe		
England	50,874	34,045,290
Ireland	32,360	4,390,219
Scotland	30,404	4,760,904
Wales	7,466	2,025,202
Isle of Man	227	52,034
Channel Islands	75	96,900
In Asia		
British India	1,093,074	244,267,542
Native States	709,118	70,864,995
Aden and Perim	80	46,165
Sarawak	42,000	500,000
Socatra	1,382	12,000
Straits Settlements	1,630	714,069
Ceylon	25,332	4,106,350
Mauritius and Dependencies	809	365,481
North Borneo	31,106	208,183
Hongkong, including New Territories	390	456,739
Brunei	4,000	30,000
Weihaiwei	285	147,133
Malay Peninsula	52,416	1,936,968
In Africa		
Union of South Africa	473,100	
Cape of Good Hope	276,995	2,564,965
Natal	35,290	1,194,043
Orange Free State	50,389	528,174
Transvaal	110,426	1,686,212
Ascension Island	34	400
Basutoland	11,716	405,600
Bechuanaland Protectorate	275,000	125,350
East Africa Protectorate	246,000	4,038,000
Egypt	350,000	11,189,000
Gambia	4,500	138,401
Gold Coast	80,000	1,503,386
Nigeria	336,000	17,000,000
Northern Rhodesia	290,000	870,000
Southern Rhodesia	148,575	750,000
Nyasaland Protectorate	39,315	1,088,000
Saint Helena	47	3,553
Seychelles	156	24,140
Sierra Leone Protectorate	27,000	1,327,560
Somaliland Protectorate	68,000	300,000
Swaziland	6,536	99,959
Uganda Protectorate	109,119	2,927,500
Zanzibar Protectorate	1,020	197,200
In America		
Canada	3,729,665	7,206,643
Labrador	120,000	3,949
Newfoundland	42,734	238,670
British Guiana	90,500	296,041
British Honduras	8,598	40,458
In Australia		
Commonwealth of Australia	2,974,581	4,455,005
Papua	90,540	400,000
New Zealand	104,356	1,008,468
West Indies		
Bahamas	4,404	55,944
Barbados	166	171,982
Jamaica and Dependencies	4,373	836,998
Trinidad (including Tobago)	1,868	333,552
Leeward Islands	717	127,188
Windward Islands	506	157,264
Scattered Islands		
Fiji	7,435	139,541
Falkland Islands	7,500	3,275
Solomon Islands	14,800	150,500
Bermuda	19	18,994
Gilbert and Ellise Islands	180	31,121
Gibraltar	2	19,586
Tonga Islands	390	21,695
Malta	117	211,564
Cyprus	3,584	273,964
	12,230,457	433,411,624

It must be understood that the statistics here given represent conditions before the outbreak of the War of the Nations in 1914. The early stages of that war gave to Great Britain

Government

Great Britain has not, like the United States, and indeed, like most great countries, a single written constitution, but its government is none the less a strictly constitutional form. In fact, England has been a leader in developing constitutional government, and many other countries have patterned after it. Much of its constitution is unwritten—a mass of precedents, institutions, decisions which have been built up through the centuries and now have all the



PRINCIPAL POSSESSIONS OF GREAT BRITAIN

The small, black spot in the northwest corner of the map is the "mother country" to vast empires stretching around the world.

force of written laws. Many documents of the utmost importance there are, however—Parliamentary acts, royal decrees, judicial decisions, and above all, five instruments which are basic. These are the Magna Charta (which see), forced from King John in 1215; the Declaration of Rights in 1689; the Act of Settlement in 1701; the Act of Union with Scotland in 1707; and the Act of Union with Ireland. Such a constitution is far more flexible and easily changed than a single written document drawn up by a constituent assembly, and it is constantly changing.

Central Government. The government of Great Britain is a hereditary constitutional monarchy, the preference being given to male heirs.

Executive Branch. Nominally, the Crown holds the supreme executive power, and there have been kings in the long course of English history who have actually been all but absolute. One power and privilege after another has been assumed by Parliament, however, and the Crown retains merely such rights and duties as have not been forbidden it by Parliament. Among those powers which still remain to the Crown are the declaration of war; the making of treaties; the granting of pardons and the issuing of passports; the appointment of diplomatic and many administrative officers; the command of the army and navy; the appointment of high officers in the Church of England, of which the king must be a communicant; and the summoning and dissolution of Parliament. Now, in theory at least, Great Britain has never departed from the doctrine that "the king can do no wrong"—that is, Parliament can never hold him responsible for any of his acts.

Since entire irresponsibility on the part of the executive works for despotism, the actual executive supremacy is vested in the king's advisory body—the *Ministry,* or *Cabinet,* which is directly responsible to Parliament. The ministers must be members of Parliament, and belong to the party which at the time is in the majority in the House of Commons. Custom has outlined the method of procedure thus: The leader of the majority in the House of Commons is invited by the king to choose a Cabinet, usually accepting himself the post of Prime Minister, or Premier. After consultation with other strong men of his party, this leader sends to the king a list of the men he thinks most suitable as heads of the various departments, and the king at once appoints them. These Cabinet members may be members of the House of Lords or of the House of Commons, but if of the latter, they must immediately resign and come before their constituents for reëlection. Unless they have made themselves extremely unpopular—in which case they would not be likely to be chosen by the leader—they need not fear the results of this election.

These ministers perform a very important legislative function, for almost every prominent measure brought forward in Parliament is introduced by them. If the Cabinet advances some policy on a serious question and

Parliament defeats it, the ministers must resign, but they have the privilege of requesting at once a new election. If the people refuse to support the policy by reëlecting the ministers, their resignation becomes unconditional. Strange as it may seem, this body—so important that it may even sign treaties without consulting Parliament—has no mention in any of the various documents which make up the written portion of England's constitution. No act of Parliament has ever sanctioned it, but it has simply grown up out of the old custom of the kings, more or less informal, of choosing wise men to act as their advisers.

Each Cabinet member is head of an administrative department, but the heads of all departments are not of necessity members of the Cabinet. If it seems, for instance, that during a certain Parliamentary session the Irish question is not likely to assume any importance, the lord lieutenant of Ireland is not given a seat in the Cabinet. Eleven department heads are always in the Cabinet, and at times that body has a membership of twenty. The eleven are as follows: First lord of the treasury—usually the Prime Minister, though that officer may choose some other portfolio if he sees fit; the lord chancellor; lord privy seal, who affixes to public documents the great seal of state; the chancellor of the exchequer; the lord president of the council; the first lord of the admiralty, who is the head of the naval board; and the five secretaries of state: for home affairs, for foreign affairs, for the colonies, for India and for war. Other ministers who frequently have seats in the Cabinet are the lord lieutenant of Ireland; lord chancellor of Ireland; the secretary for Scotland; the commissioner of works; the president of the local government board; the president of the board of trade; the president of the board of agriculture and the chancellor of the Duchy of Lancaster. No records are kept of the meetings of the Cabinet, nor of its acts, on which the history of the empire so largely depends. See CABINET.

Legislative Branch. The supreme legislative power is vested in a Parliament of two houses—the House of Lords and the House of Commons. In the upper house the peers, or lords temporal, and the archbishops and principal bishops, or lords spiritual, have seats. There are in all, somewhat over six hundred members—about five hundred English hereditary peers; twenty-eight Irish peers chosen for life by the whole body of Irish peers; sixteen Scottish peers, chosen for one term of Parliament by the whole body of Scottish peers; two archbishops and twenty-four bishops, and four judicial members chosen by the Crown. By custom, though not by law, the lord chancellor is the presiding officer of the House of Lords.

The House of Commons is an elective body of 670 members, of which England chooses 465, Wales 30, Scotland 72, and Ireland 103. They are chosen by districts for a period of seven years, and a member need not live in the district from which he is elected. A term of Parliament is seven years, but almost always the body is dissolved before the expiration of that time by the king, with the advice of his ministers.

The time-honored privileges and powers of the two houses have been very nearly alike, save that all financial matters must originate in the lower house, and no proposal could become a law without the assent of both houses. This gave the House of Lords the power to veto so many progressive movements that it was felt that some remedy was necessary. In 1832, when the Reform Bill was in question, Earl Grey induced William IV to threaten to create enough new peers to put the measure through; for there is no limit to the number of hereditary peers the king may create. Rather than submit to this, the peers passed the bill. But in 1911 a remedy was found for like conditions. A law was passed declaring that when the House of Lords has three times vetoed a measure passed upon by the House of Commons, the latter body may pass it over the veto of the upper house. This means that the House of Commons is certain of the success of any movement on which it feels strongly enough to insist.

The Judiciary. The House of Lords is not only the highest legislative, but the highest judicial body in the kingdom. If a peer commits a crime or misdemeanor, he is brought before the House of Lords for trial; if any public official is to be impeached, or any case appealed from a lower court is to be reopened, it is this body which has jurisdiction. But in cases appealed from a lower court the whole House does not act—only the lord chancellor, the four judicial members, and such other peers as may previously have held judicial offices; these peers are known as the Lords of Appeal. A coördinate body is the Judicial Committee of the Privy Council, which con-

sists of practically those same peers who have the right to hear appealed cases in the House of Lords. Before this Judicial Committee are brought cases appealed from the colonies. See PRIVY COUNCIL.

In addition to these, there are the High Court of Justice and Court of Appeal; the petty sessions and quarter sessions, which are criminal courts, and the assize courts (see COURTS, subhead *Courts in Great Britain*).

Local Government. It is difficult for anyone not thoroughly conversant with the local government system of Great Britain to understand it, so complicated and involved is it. Only since the passage of local government acts in 1888 and 1894 has it had any right to the name of system, so inconsistent has it always been. The units of government now are counties, boroughs, urban districts, rural districts, parishes and school districts. In each county there is a lord lieutenant—the representative of the Crown—together with a sheriff, justice of the peace, clerk of the peace and coroner; and each county has, as well, a council elected by popular vote, which has charge of finances, charities, local education, bridges and roads and the police system.

Counties are subdivided into *urban* districts and *rural* districts, each with its own council, which has charge of the poor laws and health laws, and other minor matters; and below the district is the *parish*, governed by an assembly consisting of every voter and all the married women. Incorporated towns are known as *boroughs*, and each one has a mayor, aldermen and councilors, who together form the council. London has special treatment. The county of London, which includes the city, is divided into twenty-nine boroughs, each of which has the same officers as any other borough. At the head of the whole complex system is a local government board, whose president is sometimes, though not always, a member of the Cabinet. The tendency at present is to increase the jurisdiction of this board.

Administration of Colonies. As noted above, the governmental systems applied to the administration of the numerous British colonies are of necessity various. A very general idea of such variation is given under the subhead *British Empire*, above, but a strict division calls for the following classes:

(1) Self-governing dominions, or those which have their own legislature and courts, but a governor appointed by the Crown. See CANADA; AUSTRALIA; NEW ZEALAND.

(2) Semi-independent colonies, which have a legislature partly elected and partly appointed, and a governor appointed by the Crown. See BRITISH GUIANA; CYPRUS; MALTA; JAMAICA.

(3) Colonies and protectorates which have a legislative council appointed by the Crown. Such is that great empire within an empire, India, with its British territory and native states. See INDIA; CEYLON; BRITISH HONDURAS; THE STRAITS SETTLEMENTS; GOLD COAST; BRITISH HONDURAS.

(4) Colonies and protectorates not possessing a legislative council, but governed by a royal commissioner. See BASUTOLAND; GIBRALTAR; UGANDA; SAINT HELENA.

There are certain territorial possessions which do not, strictly speaking, fall under any of these heads, but these include most of the important ones.

For the administration of Scotland and Ireland, see the articles on those countries, subhead *Government*. Wales needs no separate treatment, for it has been governed since the sixteenth century as a part of England. Any right or privilege which an Englishman has, a Welshman possesses in equal degree.

Defense. The problem of defense presented to Great Britain has been in one way peculiar. Itself an island, but an island with scattered possessions enough to make up the largest empire in the world, it has needed especially a strong navy, and toward the building of that attention has been directed with such good results that England has had since the decline of Spain centuries ago no rival on the sea. Its policy has been to maintain a navy which should at least equal in strength the combined navies of any two other countries in the world, and toward that end ships were multiplied rapidly during the latter part of the nineteenth and the first part of the twentieth centuries. The great merchant marine has been an added resource, for a certain number of seamen have been drilled to render service in the event of war. For statistics on Great Britain's navy see the article NAVY, subhead *Great Britain;* for the manner in which it has recently acquitted itself in actual service, see WAR OF THE NATIONS.

But if the navy of Great Britain has been the strongest in the world, the same cannot be said of its army. While on the Continent compulsory military service has been the rule, in Great Britain the principle of voluntary service has been rigidly adhered to, and as a result the British army has been the weakest among all the armies of the great European nations. The forces have been divided, since 1907, into two classes—the regular army with

its reserve and special reserve, and the territorial force, which, contrary to its name, is intended for home defense and is under no obligation to serve abroad. The strength of the armies of Great Britain, as compared with those of the other powers, is given in the article ARMY, subhead *British Army*. In this connection see WAR OF THE NATIONS.

History of Great Britain

The Union with Scotland. Although, as pointed out in the article ENGLAND, that country and Scotland had had one ruler since the accession of James VI of Scotland to the throne of England in 1603 as James I, the two countries had retained their separate legislatures, and were thus not really one country. In 1707 the Scottish Parliament was given up, and Great Britain as a political unit came into being. A new flag was adopted—the Union Jack, made by combining the white cross of Saint Andrew with the red cross of Saint George. At first there was a strong popular feeling in Scotland against the union, but gradually there arose the realization of the fact that the interests of the country were better conserved than under the old dual arrangement.

Accession of the House of Hanover. Queen Anne was the last Protestant Stuart, and when she died in 1714 the Crown passed, not to her half-brother, the Catholic son of James II, but to George, Elector of Hanover, a descendant of James I. The new king had no interest in England; he had been a German all his life, and a German he intended to remain. He was perfectly willing, to be sure, that the new kingdom should minister to his support and furnish him funds for his enterprises on the Continent, but as for the government, that could be attended to by the leaders of the Whigs, the party which had brought him to power. It was this very indifference on the part of the king which made possible the establishment of the present form of government, for Sir Robert Walpole, the Whig leader, was in reality the first Premier, though he did not assume that title; and he it was who began the custom of selecting from his colleagues an advisory body, the Cabinet. The king did not even attend their meetings; why should he, when he could not understand a word of English, and did not care to learn the language?

During this reign occurred the insurrections in the interests of James Edward Stuart (which see), the "Pretender," and the failure of that gigantic enterprise known as the South Sea Company (which see), which involved in its disaster great numbers of people and seriously embarrassed the government. Only the genius of Walpole served to bring a certain measure of order out of this crisis. Another important event, as beneficial as this was disastrous, was the introduction of the practice of inoculation for smallpox. This meant the conquest of one of the worst scourges of Europe, for even in years when there was no epidemic the disease killed off about one person out of ten in England, and a proportionate number in other countries.

Growth of Colonial Interests. George II, who came to the throne in 1727, was much like his father in his indifference to English interests. He hated Walpole, but was wise enough to keep him in power, interfering with him little except by attempting to induce him to involve England in the various struggles which were taking place on the Continent; for George II was above all things a soldier. In 1739 the country became so incensed over certain barbarities of Spain toward English traders in the West Indies that Walpole was forced against his will to declare war, and the result was far from favorable for England. This war was a sign that the New World, as it was then called, and England's trading and colonial interests there were becoming of greater importance. In the next war in which England took part—the War of the Austrian Succession—George II led the British troops in person, the last English king to take part in a battle.

But the great struggle of the reign was the Seven Years' War, which in its American phase was known as the French and Indian War. By it England's colonial interests were decidedly advanced at the expense of France, for Clive (which see), by the great battle of Plassey, established British rule in India on a firm foundation, and Wolfe won Canada by his victory over Montcalm at Quebec. Indeed, at the close of the war England was supreme over the North American continent from the Atlantic to the Mississippi.

The reign of George II witnessed another movement less spectacular but as lasting in its results—the rise of Methodism. Such a religious revival was sorely needed in an age

which saw nothing strange in such tavern signs as "Drunk for a penny; dead drunk for twopence; clean straw for nothing."

The Break with America. When George III came to the throne in 1760 he proved to be very different from his father and his grandfather. A man of excellent character, he had the best interests of his kingdom at heart and was unwilling that the ministers should continue to exercise all the power. The royal authority should be asserted, the king should dictate to the ministers instead of their dictating to him—those were the reforms which he was determined to carry through. Pitt resigned and was succeeded by Bute, who in turn gave place to North, a minister completely after the king's own heart; and it was the king and North who advocated those policies which terminated in the outbreak of the American Revolution. The king was honestly unable to see the injustice of taxing the colonies when they had no representation in Parliament, or the folly of keeping them utterly dependent, as it was his aim to do. The necessity of acknowledging the independence of the United States was a great grief to him, nor could he ever be brought to see the unwisdom of his own course. See Revolutionary War in America.

War with France. Just at the close of the American Revolution, in 1783, Pitt, son of the earlier minister of that name, was made Premier; until his death, twenty-three years later, his voice was dominant in English affairs. He it was who carried on the war against France so vigorously that Nelson was able to establish by his victory at Trafalgar the supremacy of England on the sea, and that Wellington was empowered to give a severe blow to Napoleon's cause by driving the French out of Spain. In the Congress of Vienna, which readjusted the affairs of Europe after the long turmoil, England secured very favorable terms, and gained possession of certain valuable territories. All the results of the struggle with Napoleon were not beneficial, however, for a large debt was placed upon the people, and taxes were made painfully heavy. This condition had been rendered more serious by a second war which occurred while the first was still in progress—the War of 1812 with the United States.

Another important event took place during the Napoleonic struggle. A revolt in Ireland strengthened the feeling of the English statesmen that that country should be made a part of England, and in 1800 an Act of Union was passed. Pitt made Roman Catholic emancipation a part of his proposal, but to this the king would not consent, nor was it finally secured until 1829 (see O'Connell, Daniel).

The Reform Era. It is significant of the gradual decrease in the power of the kings that reform measures should have occupied much of the public attention during the reign of George IV (1820-1830), a king who had no interest in reform of any kind. The people, suffering under the heavy burdens laid upon them by the wars, were openly murmuring, and one leader after another found it expedient to listen to their demands. Sir Robert Peel, in 1823, brought about the reform of the criminal laws, doing away with the death penalty for many minor offenses; in 1828 the Duke of Wellington, stanch Tory that he was, brought about the repeal of the obnoxious Test Act; and Roman Catholic Emancipation has been referred to above.

It was after the accession of William IV, in 1830, that the chief reforms were put through. The matter of Parliamentary elections sadly needed reform, and Earl Grey devoted all his energies to bring about a redistribution of the franchise in accordance with population. By inducing William IV to agree to the creation of a number of new peers he compelled the House of Lords to pass the Great Reform Bill of 1832 (see Grey, Charles), and he also carried out a number of minor reforms. Slavery in the colonies was abolished in 1833, and beneficial changes were made in the poor laws and the factory laws.

Queen Victoria (which see) was only a girl when she came to the throne in 1837, but she had the wisdom to adopt at the very outset of her reign the policy which she pursued to the end—the policy of allowing her ministers to deal with political matters without her interference. Her moral influence, however, and that of her husband, Prince Albert, was very plainly felt in every department of national life. Her long reign was glorious, and the list of its statesmen includes Peel, Bright, Cobden, Russell, Palmerston, Salisbury, Disraeli and Gladstone (whose lives are given in these volumes). Noteworthy among the reforms of the early part of the reign was the repeal of the Corn Laws (which see) in 1846; while among the reform measures of the later period of her reign was the Act of 1867, which broadened the franchise and gave the workingmen a voice in the government. The country was making strides towards democracy.

The life of the country was practically revolutionized during the period that Victoria was on the throne. At the beginning there were but a few miles of railway in the kingdom, and there was not a telephone or a telegraph line; before its close railways ran everywhere, people talked to each other from end to end of the kingdom and messages flew over thousands and thousands of miles of wire.

Wars of the Reign. It had been the policy of England since the early nineteenth century not to be drawn into wars unless it was absolutely necessary, but struggles could not always be avoided. There was the Crimean War of 1854-1856, in which England successfully engaged in checking the ambitious designs of Russia; the Sepoy mutiny of 1857, which had as its result the transfer of India from the authority of the East India Company to that of the Crown; and the South African War of 1899-1902, which resulted in the annexing of the Transvaal and the Orange Free State to the empire as colonies. Each of these wars is treated under its own title.

The Twentieth Century. More than ever before it was noticeable during the reign of Edward VII (1901-1910), son of Queen Victoria, that Great Britain was an empire in more than name. The colonies had shown their loyalty during the war in South Africa, and they began to give evidence in other ways of the fact that they felt themselves to be a part of one great country. The Australian colonies were federated in 1901 into a Commonwealth, but the relations with the mother country were closer and more cordial than ever before. During Edward's reign a crisis was reached in Parliamentary affairs, the question of the veto power of the House of Lords becoming acute. Edward's death and the accession of his son, George V, in 1910, caused a temporary cessation in the strife over the budget question, but in 1911 there was passed a bill which made a greater change in Parliamentary affairs than had any legislation since the Reform Bill of 1832. This was the removal from the upper house of the permanent veto power. It declared not only that the upper house had no right to amend or reject a financial bill, but that any bill which was passed by the Commons at three successive sessions became a law despite the disapproval of the House of Lords.

The early years of the reign of George V were marked by severe labor troubles in 1911 and 1912, including a number of serious strikes; the disestablishment of the Church of England in Wales in 1914; and the passage of the act allowing home rule to Ireland (see HOME RULE). Out of this Home Rule Bill there grew a disturbance in the Irish county of Ulster, which for a time was very acute. The Orangemen there refused to countenance home rule because it would mean the dominance in the island of the Roman Catholic faction, and actual civil war was averted only by the outbreak of a greater struggle—the War of the Nations, which began in the summer of 1914.

Great Britain and the War. The violation of Belgian neutrality by Germany was announced by Great Britain as the cause which led it to declare war on Germany on August 3, 1914. The military and naval forces of the empire were at once mobilized. The colonies showed wonderful loyalty, sending volunteers in great numbers, while in the kingdom itself —in England, Ireland and Scotland—the unanimity of purpose was even more remarkable. Possibly never before in all its history had the nation been so entirely united on any great matter. The military events of this greatest conflict of all times are treated in the article WAR OF THE NATIONS. A.MC C.

Consult Dilke's *Greater Britain;* Seeley's *The Expansion of England;* Fox's *British Empire;* Besant's *The Rise of An Empire.*

Related Subjects. Of the numerous articles in these volumes which are connected with the subject of Great Britain, many are listed in the indexes under ENGLAND, IRELAND, SCOTLAND and WALES. The following list will simplify reference not only to those indexes but to the topics below as well:

CITIES AND TOWNS

See lists under ENGLAND, IRELAND, SCOTLAND, WALES.

COLONIES

See list in article above.

GOVERNMENT

Cabinet	Magna Charta
Empire	Parliament
Exchequer, Chancellor of the	Premier
Flag	Privy Council
Imperialism	Privy Seal
King	Supremacy, Royal

For more general topics, see list under CIVIL GOVERNMENT.

HISTORY

For earlier history, see lists of *Related Subjects* under ENGLAND, IRELAND, SCOTLAND, WALES.

Alabama, The	Black Hole of Calcutta
Balaklava	Boston Massacre
Bering Sea Controversy	Boston Port Bill

OUTLINE AND QUESTIONS ON GREAT BRITAIN

Outline

I. Size and Location

(1) Rank among islands of the world
(2) Actual size, 88,094 square miles
(3) Situation with reference to Europe
(4) Effect of shape and position

II. Physical Features and Industries

See outlines on *England, Scotland, Wales*

III. Transportation and Commerce

(1) Navigable rivers
(2) Canals—neglected state
(3) Railroads
(4) Foreign trade
  (a) Effects of, on history and on naval supremacy
  (b) Merchant marine largest in world
  (c) Imports greater than exports

IV. Colonial Possessions

(1) Extent of empire
(2) Protectorates
(3) Colonies
  (a) Self-governing
  (b) Crown colonies
(4) Government

V. Government

(1) Unwritten law
(2) Central government
  (a) King
  (b) Cabinet
  (c) Parliament
    1. House of Commons
    2. House of Lords
  (d) Courts
(3) Local government
(4) Defense
  (a) Army
  (b) Navy

VI. History

For early stages, see *England, Scotland, Wales*

(1) Union with Scotland
(2) The accession of the Hanoverians
(3) Spread of empire
  (a) In America
  (b) In India
(4) Revolutionary War in America
(5) The Napoleonic struggle
(6) An era of reform
(7) Recent happenings
  (a) Imperial growths
  (b) South African War
  (c) Irish Home Rule question
  (d) War of the Nations

Questions

What change was made in the management of railroads at the outbreak of the War of the Nations?

What happens to the Cabinet when an important measure is defeated?

Sketch briefly the part which Great Britain has played in the development of Australia; of North America.

How can the country be governed without a constitution?

What part has British inventive genius played in bringing about the great growth of the country?

If Great Britain were deprived of all that has grown out of the victories of Clive and Wolfe, how much smaller would its empire be?

Why was there objection to Irish Home Rule in Ireland itself?

How many islands as large as Great Britain would its greatest colonial possession make?

What king of England could not speak English?

Show by means of a globe that "the sun never sets on British soil."

Describe the British flag. How was it made?

How does the merchant marine of Great Britain rank with those of other countries?

How did a law of 1911 in which Home Rule was not mentioned secure Home Rule for Ireland?

Boston Tea Party
Brandywine, Battle of the
Brunswick, Family of
Bunker Hill, Battle of
Chartism
Clayton-Bulwer Treaty
Continental System
Corn Laws
East India Company
Fifteen Decisive Battles
French and Indian Wars
Germantown, Battle of
Ghent
Guilford, Battle of
Hay-Pauncefote Treaty
Intolerable Acts, Five
Jay Treaty
Leipzig, Battles of
London Company
Long Island, Battle of
Louisburg Sieges of
Lundy's Lane, Battle of
Navigation Acts
Orders in Council
Paris, Treaties of
Powers, The Great
Quebec, Battle of
Quebec Act
Quebec Resolutions
Queenstown Heights, Battle of
Revolutionary War in America
Rotten Boroughs
Saratoga, Battles of
Sepoy Rebellion
South African War
South Sea Company
Stamp Act
Test Acts
Thames River, Battle of the
Trafalgar
Trent Affair, The
Trenton, Battle of
War of 1812
War of the Nations
Waterloo, Battle of
Webster-Ashburton Treaty

LITERATURE

See ENGLISH LITERATURE.

The biographies of eminent men contain much historical matter. The rulers are listed in the article ENGLAND, and the soldiers and statesmen of the early period are given in the *Related Subjects* index under that article.

SOLDIERS AND STATESMEN

Abercrombie, James
Aberdeen, Earl of
Andre, John
Argyll, Dukes of
Asquith, Herbert Henry
Baden-Powell, Robert S. S.
Balfour, Arthur James
Braddock, Edward
Bright, John
Bryce, James
Burgoyne, John
Burke, Edmund
Carleton, Sir Guy
Chamberlain, Joseph
Chesterfield, Earl of
Churchill, Winston L. S.
Clinton, Sir Henry
Clive, Robert
Cobden, Richard
Cornwallis, Charles
Curzon, Lord
Dufferin and Ava, Marquis of
Fox, Charles James
Gage, Thomas
George, David Lloyd
Gladstone, William E.
Gordon, Charles George
Grey, Earl
Grey, Sir Edward
Harcourt, Sir William George
Hastings, Warren
Havelock, Sir Henry
Howe, Sir William and Richard
Hutchinson, Thomas
Jameson, Leander Starr
Kitchener, Earl
Lansdowne, Lord
Lytton, Edward Robert Bulwer
Macaulay, Thomas Babington
Marlborough, Duke of
Milner, Alfred
Monck, Lord Charles
Moore, Sir John
Morley, John
North, Lord
Outram, Sir James
Pakenham, Sir Edward M.
Palmerston, Viscount
Pauncefote, Julian, Lord
Peel, Sir Robert
Pitt, William
Redmond, John Edward
Rhodes, Cecil John
Roberts, Earl
Rosebery, Archibald P. P.
Russell, John
Saint Leger, Barry
Salisbury, Marquis of
Shaftesbury, Earl of
Walpole, Horace
Wellington, Duke of
Wilberforce, William
Wolfe, James
Wolseley, Garnet Joseph

ISLANDS

See classified list under article ISLAND.

PRODUCTS

See lists under ENGLAND, IRELAND, SCOTLAND, WALES.

RIVERS

See lists under ENGLAND, IRELAND, SCOTLAND, WALES.

GREAT DANE, the name given to a breed of large dogs which are noted for their great strength, agility and handsome appearance. The breed originated in Denmark, from which fact the name is derived; they were formerly used there for hunting boars and deer. Great Danes vary greatly in color, the most highly-prized usually being fawn or brindled, but a dark bluish-gray is popular. They are usually about the same size as mastiffs, often weighing 100 pounds, and make affectionate and faithful companions.

THE GREAT DANE

GREATER ANTILLES, *an til' eez.* See ANTILLES.

GREATEST COMMON DIVISOR. The greatest common divisor (G. C. D.) of several numbers is the largest number which will exactly divide each of them; for example, 14 is the G. C. D. of 42, 70 and 98; 3 is the G. C. D. of 15, 24 and 21.

The greatest common divisor is also called the *highest common factor.* (See FACTORING and study it in connection with this subject.)

$8 \times 13 = 104$	$104 \div 13 = 8$
$5 \times 13 = 65$	$65 \div 13 = 5$
$3 \times 13 = 39$	$39 \div 13 = 3$
$7 \times 13 = 91$	$91 \div 13 = 7$

(a) We see here how 104, 65, 39 and 91 are built up, 13 being the factor common to all; being, moreover, the only factor common to all, it is the highest common factor.

(b) Since 13 is the largest *factor* common to these numbers, it is the largest number that will *divide* each of them.

(c) The *largest common factor* that goes to make up several numbers is the *largest divisor* that is found in each of the numbers.

(d) Therefore, in seeking the G. C. D. we seek for the *highest common factor.*

(1) Find the G. C. D. of 16, 40, 72. Factoring, we see:

$$16=2\times 8$$
$$40=5\times 8$$
$$72=9\times 8$$

and recognize 8 as the G. C. D.

(2) Find the G. C. D. of 75, 45, 105, 135.

$$75=5\times 5\times 3$$
$$45=3\times 5\times 3$$
$$105=7\times 5\times 3$$
$$135=3\times 5\times 3\times 3$$

Here we find 5×3, or 15, to be the G. C. D.

(3) Find the G. C. D. of 672, 504, 924.

$$672=(2\times 2)\times 2\times 2\times 2\times 3\times \quad 7$$
$$504=(2\times 2)\times 2\times \quad 3\times 3\times 7$$
$$924=(2\times 2)\times \quad 3\times \quad 7\times 11$$

We see that (2×2) is common, and 3 is common, and 7 is common to all the numbers as a divisor; therefore (2×2×3×7), or 84, is the G. C. D.

If the young student has difficulty in seeing this, he will find it helpful to write the factors in this way:

$$672=2\times\ 2\times 2\times(2\times 2\times 3\times 7)$$
$$672=\quad 8\quad\times\quad 84$$
$$504=2\times\ 3\quad\times(2\times 2\times 3\times 7)$$
$$504=\quad 6\quad\times\quad 84$$
$$924=\quad 11\quad\times(2\times 2\times 3\times 7)$$
$$924=\quad 11\quad\times\quad 84$$

Below it is seen that we may break up the numbers into their *composite* factors and from these find the G. C. D.

$$225=15\times 15$$
$$150=10\times 15$$
$$375=25\times 15$$

15 is common, and there is the common factor 5 in 15, 10 and 25. So we know that 75 is the G. C. D. and we see:

$$225=3\times 75$$
$$150=2\times 75$$
$$375=5\times 75$$

We may find the common prime factors in this way:

5	225	150	375
5	45	30	75
3	9	6	15
	3	2	5

5, 5 and 3 are the common divisors, and their product, 5×5×3, or 75, is the G. C. D.

When numbers are *prime to each other,* their G. C. D. is 1; in other words, they have no G. C. D.; for example 7, 20 and 9.

When the factors of several numbers cannot be found at sight, nor by using tests for divisibility of numbers, the following method is used for finding the G. C. D.:

Find the G. C. D. of 4633, 697 and 943.

(a)
$$\begin{array}{r|l} & 6 \\ 697 & 4633 \\ & 4182 \quad 1 \\ \hline 451 & 697 \\ & 451 \quad 1 \\ \hline 246 & 451 \\ & 246 \quad 1 \\ \hline 205 & 246 \\ & 205 \quad 5 \\ \hline 41 & 205 \\ & 205 \\ \hline \end{array}$$

(b)
$$\begin{array}{r|l} & 23 \\ 41 & 943 \\ & 82 \\ \hline & 123 \\ & 123 \\ \hline \end{array}$$

41 is the G. C. D. of 4633, 697 and 943.

GREAT FALLS, Mont., noted for its great smelting works, is situated a little northwest of the geographical center of the state, in Cascade County, of which it is the county seat, and on the Missouri River. Helena is ninety-nine miles southwest; Butte, also southwest, is 173 miles distant; and Billings is 235 miles southeast. The Great Northern Railway, built to the city in 1887, and the Chicago, Milwaukee & Saint Paul, constructed to this point in 1913, provide transportation facilities. The city was settled in 1883, was incorporated in 1887 and named for the great falls of the Missouri River, which at this point have a total descent of 500 feet. Its population, chiefly American, was 13,948 in 1910, giving the city second rank in the state (after Butte).

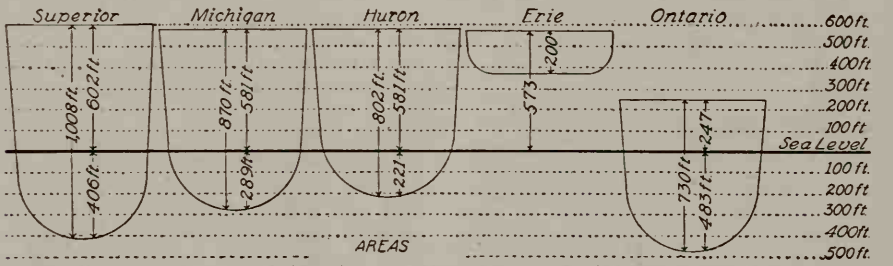
Great Falls is an attractive city, with wide, shaded streets and a park system covering 640 acres. It is located in a territory famous for scenic beauty, which is productive as well as picturesque. Gold, silver, copper, lead, iron, bituminous coal and sandstone are found in abundance; upon these resources depend the leading industries of the city. The smelting works of one mining company alone employ 1,250 people, the monthly pay roll amounting to between $125,000 and $150,000. A remarkable structure in connection with the smelting industry is a smokestack, claimed to be the largest in the world. It stands on a hill, and rises 506 feet above the foundation, its height being exceeded only by two buildings in New York City, the Washington Monument and the Eiffel Tower. The immense dam at Black Eagle Falls furnishes abundant water power for manufacturing purposes, and the number of flour and oatmeal mills, beet-sugar and canning factories suggests the agricultural wealth of the vicinity; the yield of alfalfa is most

important. The city is also a distributing center, and is an important shipping point for wool.

The most notable among a number of handsome modern buildings are the Federal building, constructed in 1912 at a cost of $237,000; the Rainbow Hotel, erected in 1910; the Park Hotel, built in 1915, and a $150,000 Y. M. C. A. building. Besides these the city has the Cascade County courthouse and the passenger stations of the Great Northern and the Chicago, Milwaukee & Saint Paul railways. Ursuline Academy, a business college and a Carnegie Library supplement the public school system. A.J.B.

GREAT KANAWHA, *ka naw' wa,* an important tributary of the Ohio River, and one of the chief commercial waterways of the state of West Virginia. It rises in North Carolina, between the Blue Ridge and the Iron mountains. It is known as the *New River* in North Carolina, from which it flows in a northeasterly direction through part of Virginia and West Virginia, and after traversing a portion of the Alleghany Mountains joins the Ohio River at Point Pleasant. Its principal tributary is the Gauley River, which it receives in Fayette County, West Virginia. The river is navigable from the Ohio to within a few miles of the mouth of the Gauley River, a distance of about 100 miles, and carries much local commerce. Its total length is 450 miles. It flows through thriving districts, the principal city on its banks being Charleston, the capital of West Virginia.

GREAT LAKES, The, five great inland seas of North America, surpassing in area any other series of fresh-water lakes in the world and comprising one of the most important commercial waterways on the globe. They are known as Lakes Superior, Michigan, Huron, Erie and Ontario. The small Lake Saint Clair lies between Huron and Erie, but its size renders it too insignificant to be classed among the "great" lakes. With the exception of Lake Michigan, which is entirely within the United States, they lie between that country on the south and the Dominion of Canada on the north, and form the headwaters of the Saint Lawrence River system. By this stream they are drained into the Atlantic Ocean. The deepest channel of the lakes forms the boundary line between the United States and Canada. The great valley in which they lie is situated on the southern slope of the Height of Land, which extends from ocean to ocean across the North American continent; the land to the north of the rim of their basin slopes toward Hudson Bay, and that to the south toward the Gulf of Mexico.



THE GREAT LAKES
Elevations above sea level, total depths and areas.

Size and Elevation. The Great Lakes have a combined area of about 94,000 square miles, which is more than 27,000 square miles in excess of the total area of the six New England states and a little less than that of Oregon. Their area is about one thirty-ninth that of the Dominion of Canada, and nearly one-seventh that of the province of Quebec. Rhode Island, the smallest state in the Union, could be placed on this area seventy-five times, and there would still be over 1,000 square miles to spare. The area of England, Scotland and Wales combined is not quite as great as that of these five fresh-water seas. Lake Superior, the largest, is a little smaller than Maine and a little larger than South Carolina. Next in size is Lake Huron, which is almost as large as West Virginia. Lake Michigan has an area equal to that of Maryland, Massachusetts and Delaware combined. Then comes Lake Erie, the most shallow of the five, which is about the size of Vermont. Lake

MAP OF THE GREAT LAKES

The largest cities on the lakes, and smaller towns with important steamer lines, are shown. For locations of the international boundary, see maps with the articles on the individual lakes.

Ontario, the smallest, is not quite as large as New Jersey. The elevation of the lakes varies from about 600 feet in Lake Superior to 247 feet in Lake Ontario, the most decided drop being between Lakes Erie and Ontario, where there is a descent of 326 feet. The accompanying maps show their relative positions, their areas, their depths and their heights above sea level. In addition, each of these lakes is described in these volumes under its title.

A Journey on the Lakes. The traveler on a steamer making the trip between Duluth, at the head of Lake Superior, and the Canadian city of Kingston, Ontario, at the foot of Lake Ontario, will enjoy a most interesting journey of 1,245 miles. When the boat reaches the eastern end of Lake Superior to make the passage into Lake Huron, it will encounter the dashing rapids of the Saint Mary's River, the stream connecting the two lakes. From the upper lake to the river there is a drop of about twenty feet. Navigation there would be impossible were it not for the magnificent system of canal locks constructed around the rapids by the American and Canadian governments (see SAULT SAINTE MARIE CANAL). On the Canadian side there is one lock, and on the American side three, the third of which was opened to navigation in October, 1914. A fourth is now under construction.

Through the locks the boat steams out on the quiet waters of the Saint Mary's River, passing by its green and wooded banks for a distance of fifty miles until Lake Huron is reached. Numerous vessels are seen along the course; of these there are none more interesting than the enormous steel boats whose long, boxlike holds are filled with vast quantities of grain and ore from the northwest. The largest of these carry 10,000 tons. They offer a decided contrast in appearance and use to the magnificent passenger steamers, hotels on the water, which give thousands of tourists every summer a taste of life on the sea.

From Lake Huron the boat passes through the Saint Clair River, Lake Saint Clair and the Detroit River, into Lake Erie. The greatest descent of the entire trip is reached at the eastern end of Lake Erie, for the drop from that body of water into Lake Ontario is more than fifteen times as great as that at the rapids of the Saint Mary's. Here are located the famous falls of the Niagara River (see NIAGARA FALLS AND RIVER), and to overcome this obstruction to navigation the Canadian government has built, several miles west of the

Niagara, the Welland Ship Canal (see WELLAND CANAL). Should the traveler desire, he could continue his journey to the Atlantic Ocean by way of the Saint Lawrence River. Passenger boats often make the trip down the rapids of that great stream, but freight is carried through canals that have been built around the rapids. Buffalo, south of Niagara Falls, is connected with Albany, N. Y., by the famous Erie Canal (which see), and the Canadian government is now building a canal from Lake Saint Clair to Lake Erie.

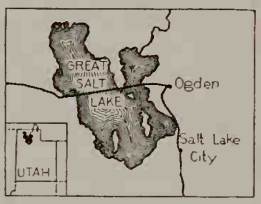
The Great Lakes offer to the summer tourist trips of great variety and interest, and there have been built along their shores numerous thriving resorts. The lakes are diversified by many beautiful bays and islands, famous among which are Georgian Bay, an arm of Lake Huron, and Mackinac Island, at the northwest extremity of that lake (see GEORGIAN BAY; MACKINAC ISLAND).

The Great Lakes Commerce. The Great Lakes form a highway of immense commercial importance. On their waters may be found one-half the tonnage in the United States merchant marine, and every year there passes through the Detroit River a greater tonnage than that of the foreign boats which enter and clear in the ports of both the Atlantic and Pacific coasts. The shipping through the Sault Sainte Marie Canal exceeds that through the Suez Canal, the annual tonnage being about 58,000,000. The bulk of the freight carried on the lakes consists of iron ore, coal, lumber, grain, flour, package freight and copper. It is generally admitted that the development of the great ore deposits on the shores of Lake Superior, near Duluth, and in Northern Michigan and Wisconsin, is due to the cheap and convenient means of transportation furnished by the Great Lakes. These waters are also important in supplying cheap shipping facilities for the enormous wheat crops of the Canadian Northwest.

Shipbuilding on the lakes has also developed to a remarkable degree within recent years, the increase of steel construction showing a percentage advancement in excess of that of any of the great maritime nations since the early period of steel ship-construction. Some of the finest vessels afloat are built in the Great Lakes shipbuilding yards. These great inland seas give a shore line to eight states of the Union, having a combined population of over one-third that of the entire country. Each year more than 24,000 vessels enter the six principal lake ports—Chicago, Buffalo, Cleveland, Milwaukee, Detroit and Duluth.

A noble fountain symbolizing the five Great Lakes, designed by Lorado Taft, stands on the southern side of the Art Institute, Chicago. See page 1311.

GREAT SALT LAKE, one of the natural wonders of the world, lying in a region of great scenic beauty, in the northwestern part of the state of Utah. It is seventy-five miles long and about fifty miles wide, and covers an area of about 1,750 square miles, nearly one and one-half times the size of Rhode Island. This area varies, however. In winter more water comes to it and there is less evaporation. The amount of yearly rainfall or snowfall and the amount of water of tributary streams used for irrigation also affect the area.



GREAT SALT LAKE
The route of the Lucin Cut-off is shown. The small black area in the corner map gives the location of the lake in the state.

One of the most remarkable features about the lake is that though it has no connection with any sea or ocean, and is formed and maintained by rivers of fresh water, it is a sea of salt, 4,218 feet above sea level. It is five and a half times as salty as the oceans of the world. At the present rate of use of salt it has been estimated that there is enough salt in solution in the waters of this lake to supply the United States for nearly a thousand years.

The chief rivers feeding Great Salt Lake are the Jordan, the Weber and the Bear. The latter is 400 miles long, but its mouth is only ninety miles from its source. Those waters contain so little salt it cannot be discovered by taste. But Great Salt Lake has no outlet, so the waters brought to it evaporate and the solid matters which were dissolved in them remain. That is why the lake is salt.

Within this lake are several islands which, like its shores, are whitened by salt. On these, immense flocks of gulls, ducks, geese and pelicans breed each year. On Antelope Island, the largest, alfalfa is being cultivated and cattle are raised. There are no fish in the waters, but the lake contains a small brine shrimp. A tiny fly also lives there while it is still a grub.

A celebrated pleasure resort, Saltair, is built 4,000 feet out in the lake. Tourists enjoy bathing in the clear salt water, which is so dense with dissolved mineral matter it is impossible for a person to sink. Another point of interest is the railroad crossing the center of the lake, called the Lucin Cutoff, connecting Lucin, at the west, with Ogden, 103 miles to the east. Twelve miles of the road across the lake is on a trestle and the rest is on a solid foundation built upon beds of salt.

About 40,000 tons of salt are gathered from the lake each year, by drawing the water off into shallow ponds and evaporating it by the heat of the sun. M.S.

GREAT SLAVE LAKE, a large lake in the northwest of Canada, covering an area of 10,719 square miles, a water area more than a thousand square miles larger than Massachusetts and Rhode Island combined, and one and a half times the size of Lake Ontario. It lies about 250 miles south of the Arctic Cirble, 300 miles southeast of Great Bear Lake and 500 miles north of Edmonton, Alberta. The shore line is very irregular, with rugged and barren shores on the north, and well-wooded slopes on the south and west. The water is deep, clear and cold, and the surface of the lake is dotted with numerous islands. Fish of many varieties abound. The lake is frozen for more than half the year, but is navigable from July to October, when great quantities of lumber are shipped from the western shores. The lake is a favorite resort of trappers, and large numbers of fur-bearing animals are caught in the vicinity.

LOCATION MAP

Great Slave Lake is a part of the Mackenzie system, the greatest river system in Canada. Though the lake receives from the north the surplus waters of Lake Aylmer and several smaller bodies, its chief source of supply is the Slave River, which brings from the south the surplus waters of the Peace River and the Athabaska system. From Great Slave Lake in turn issues the Mackenzie (which see).

GREAT SLAVE RIVER, a river of Canada which flows from Alberta into the North West Territories, carrying the surplus waters of Athabaska Lake northwestward into Great Slave Lake. Soon after it leaves Athabaska Lake it has poured into it from the west the floods of the Peace River. Its total length is about 300 miles, and through all but thirteen miles of its course it is navigable for steamers, except in the icebound winter months. In its lower course it flows through a valley which rivals the Peace River valley for fertility.

GREAT WALL OF CHINA. See CHINA, subtitle *History,* where an illustration appears.

GREBE, *greeb,* one of a curious family of water birds which acquires the art of swimming the day it is hatched. It is about nineteen inches long, and the neck is of dark red which changes later to gray or silvery white. The grebe has short wings and a heavy body and flies with its feet far apart. The toes are bordered by a membrane, and on land, where the bird seldom ventures, it appears awkward and really out of its element. There are about thirty species of the red-necked grebe found in North America, but other species are scattered all over the world where there is an average temperature.

THE GREBE

The ingenious grebe builds its nest of grass and rushes and packs it with moss until almost water-tight, and then attaches it by means of mud to tufts of grass, or allows it to drift with the tide in some marshy inlet. About five chalky-white eggs are laid and covered over with vegetable matter when the bird leaves the nest. The male bird keeps close at hand after the young are hatched, and he supplies the nestlings with small fish and insects. If danger threatens the grebe dives quickly, and it is very expert and graceful in swimming. The crested grebe, hell diver, pied-billed and spirit duck are the most common species.

The grebe is hunted for its skin. This is in demand for muff coverings, hat ornaments, and the like, for the plumage of the bird is heavy and the down is silken in its smoothness.

GREECE, a kingdom of Europe which occupies the easternmost of the southern peninsulas of the continent. It does not rank among the great powers, but it has a heritage more glorious than that of any other nation; for in the days when the ancestors of the present-day English, Germans and French were still living in barbarism, Greece was the one great country of the world. Its art, its literature, its government were very highly developed—so highly that all the modern countries in all the centuries since have been able to make little advance upon them. When Greece is referred to, most people think not of present-day Greece, with its strictly modern problems to meet, but of ancient Greece with its beautiful buildings, its inspired poets, sculptors and architects, and its wars. The writings of the modern authors of Greece have never replaced those of Homer, Aeschylus or Euripides; its most magnificent modern structures have never rivalled the Parthenon, the Erectheum or the Theseum.

After the Balkan war of 1912-1913, the area of Greece was 41,933 square miles, or a hundred square miles smaller than Tennessee. This was a large increase over its previous area, which had been but 25,000 square miles, or thereabouts, and the population was also increased from about 2,600,000 to 4,400,000. Any statement of the area of Greece includes that of the numerous islands of the Aegean Sea, which are industrially as well as historically closely bound up with the mainland. Had it not been for these "stepping stones" from Greece eastward to Asia Minor, the Greeks would hardly have been tempted so early to cross the Aegean and found their colonies on the eastern shore (see subtitle *History,* below). These colonies had a very great influence on the history of Greece, for they proved a strong temptation to the kings of Persia, and thus involved Athens and its allied cities in their epoch-making struggle with that country.

LOCATION MAP

Fair Greece! sad relic of departed worth!
Immortal, though no more; though fallen, great!

Ancient Greece

It is common to speak of Greece as a *country,* but it was not such in ancient days, in the sense in which England or the United States is to-day. It consisted, during the greater part of its history, of a number of little independent states, which were frequently struggling with each other for supremacy. The geography of the peninsula accounted in large measure for this; tall mountains with their steep valleys divided the little plains on which the various settlements had grown up, and these prevented that free intercourse which might have resulted in a federation or empire. Very often, when the term *Greek* is used in connection with art or civilization, it is *Athenian* which is meant, for it was Athens which conferred upon Greece much of its glory. The distinction, however, is no longer sharply made.

The People. The inhabitants of this wonderful land of myth and history were called by the Romans *Greeks,* but their name for themselves has always been *Hellenes,* a certain mysterious Hellen having been their ancestor, according to the popular legend. Related though they held themselves to be, there were four well-defined Hellenic families or tribes, the *Achaeans,* the *Aeolians,* the *Ionians* and the *Dorians* (which see). The two last-named

families were most important in historic times. All of these Hellenes had an intense pride in their race and their ancestry, and looked with a pitying contempt upon the *barbarians,* as they called all non-Greek people.

It is difficult to make general statements about the ancient Greeks, so widely did they differ among themselves in certain respects. It may be recorded, however, that the Athenians and all their neighbors in Attica were quick and bright, while the Boeotians were so slow and dull-witted that their name has become proverbial for stupid people. Again, the Athenians loved luxury, and they embellished their homes and their city, but the Spartans reduced life to its very simplest terms and cared only for that which made for perfect physical health (see ATHENS; SPARTA). But of practically all the ancient Greeks it may be said that they loved beauty with an intensity so great that anything ugly caused them positive pain. The modern proverbs that "Beauty is only skin deep" and "Handsome is as handsome does" would have found no response in the Greek mind, for to them goodness without beauty was a thing difficult to conceive. It was because of this love of the beautiful that the Greeks became the supreme architects and sculptors of the world (see ARCHITECTURE; SCULPTURE), and that their poets stand among the greatest of all time (see HOMER; SAPPHO).

Religion. The Greeks were a religious people by instinct, and in early times their veneration for the gods was profound and sincere. The Apostle Paul, in his sermon on Mars Hill, declared, "Ye men of Athens, I perceive that in all things ye are too superstitious," or as later translations give it, "very religious." Of late years much attention has been paid to the religion of the ancient Greeks; scholars study it because of the light it throws on history and on Greek life, and general readers find it fascinating because of its story quality. For these people with the wonderful imagination wove about their gods and heroes countless tales which still keep the freshness of those early days in which they were first told (see MYTHOLOGY, subheads *Greek* and *Roman*). It is impossible to consider the literature or the art of Greece without reference to its mythology, for the poet sang his loftiest hymns to the gods, or told of their adventures in stately verse; the architect reared exquisite temples to them, their power and beneficence being his inspiration; and the sculptor carved them, from the least to the greatest, in marble. The great Greek festivals, too, grew out of the worship of the gods, and both tragedy and comedy had their origin in religious observances.

To be sure, the Greek gods were not such beings as a modern worshiper could bow down to; they were jealous, lustful and revengeful, moved in all things by their own desires; but they were always ready to reward real homage paid to them.

Education. The Spartans had worked out for themselves a system of education which differed from every other system in Greece, as well as from those of modern states. Parents had not first claim on their children; these belonged to the state. Baby boys were examined by a Council of Elders, and if they were defective or weakly they were placed on the open hillside to die. The result was a race which closely attained to physical perfection. At the age of seven the boys were turned over to public officers, and their education was begun. They did not learn to read and write, or to care for literature; they were not encouraged to become orators, or even to converse, for practically all of their education was physical. To bear intense pain without flinching, to endure privation, to fight, to run, to wrestle—all of these the Spartan boy was carefully taught, for Sparta was a nation of warriors and cared for no citizens who could not strengthen the military arm.

In Athens and the remaining Greek states, on the other hand, a far more rounded system of education prevailed. Many private schools existed, and in these the boys were taught gymnastics, reading, writing, arithmetic, music, and, in their later years, rhetoric and philosophy. Probably the world has never seen a better-educated class of men than were the Athenians.

Education, in every Greek state, was all for the men. Although the women were not abused, they by no means held such a dignified position in their world as modern women have gained. They were not closely confined, as in Mohammedan countries to-day, but they were not allowed to appear frequently in public, or even to mingle with mixed gatherings in their own homes. If it be true, as so often said, that "a civilization can rise no higher than the status of its women," this was a serious fault in Greek culture.

Slavery. This was the great curse of Greece. Incredible as it may seem, there were many more slaves in the larger industrial centers of Greece than freemen, nor were the slaves

always of inferior birth or intelligence. All captives of war were made slaves, and many debtors became the chattels of their creditors. In general, the slaves were fairly well treated, and sometimes a man of decided intelligence, like Aesop (see AESOP'S FABLES, subhead *Aesop*), held a position of honor in the household. This was not true at Sparta, where most of the serfs were terribly oppressed, and where there was constant fear of their revolting.

History. The history of the ancient Greeks is told in the heading *History*, below. The detailed stories of ATHENS and SPARTA are related under those titles.

Modern Greece

The People. The English poet Byron, who loved Greece better than his native land, wrote sadly,

> The isles of Greece, the isles of Greece,
> Where burning Sappho loved and sung;
> Where grew the arts of war and peace,
> Where Delos rose, and Phoebus sprung!
> Eternal summer gilds them yet,
> But all except their sun is set.

Anyone who takes up the study of modern Greece after studying its ancient history feels a touch of the same sadness. When the Greeks lost their freedom and became subject to Rome in 146 B. C., they seemed to lose many of their best qualities also. That independence and vigor which seem so characteristic of dwellers in mountainous country disappeared, and the Greeks became a fawning, treacherous people, utterly untrustworthy in business dealings. The old love for beauty degenerated to a large extent into a fondness for display; and the contempt for manual labor, which was permissible enough when there was a large body of slaves, manifested itself in an overwhelming desire for easy official positions. Since Greece threw off the yoke of Turkey, however, there has been a remarkable change for the better, and under the influence of the freer institutions the higher qualities of the ancient Greeks are being reborn in these modern descendants. The present population of Greece has a very small foreign element, and the Albanians, who make up by far the largest part of the non-Greek population, are gradually becoming absorbed. Over 300,000 Greeks have within the last generation emigrated to the United States, and the money which they send or carry back to their old homes has been a real asset to the country.

Industries. Greece is primarily an agricultural country, and about one-fourth of the land is under cultivation. The farmer is confronted with many drawbacks, however, for while the climate is subtropical and would make possible the growing of many kinds of crops, the soil is thin and the rainfall is very light in the summer months. Because there is more rain in the western mountains than on the eastern plains, the farms are more numerous among the mountains, curious as that may seem. Marshy stretches are being drained and dry places irrigated, and thus the cultivable area is being steadily increased.

COMPARATIVE AREAS

Chief Crops. The most distinctive crop, as well as one of the most important, is the small, seedless grape known as the *currant*, because it is most successfully grown in the neighborhood of Corinth. This is not the little tart fruit known in America as the currant, but a true grape, which is either dried or made into wine of an inferior quality. All over Greece is to be seen the dusty gray-green of the olive trees which for so many centuries have been of importance in the life of Greek farmers. So important are they that the Turks during their domination could think of no better way of punishing insurrection than by cutting down the olive trees. To-day there are about 15,000,000 trees in the country, and each tree produces nearly ten pounds of oil annually.

Wheat, too, is one of the chief crops, but with their primitive methods the peasants are not able to raise enough to supply the home demand, and the cereal is imported in large quantities. Since vegetables form the staple diet of the people, huge gardens are numerous, and in every grassy place are to be seen herds of sheep and goats, from whose milk cheese is made. Almost no butter is used, olive oil largely taking its place.

Mining. Greece is not rich in minerals, and those which it has are not easily mined because of the entire absence of coal. Near Athens there are lead mines of large size, and from the ore considerable silver is taken. Heaps of

slag show that the ancients worked this field, but it was done so poorly that it has paid modern investors to rework the slag. Most famous of all the mineral products of Greece is the marble from Pentelicus and the island of Paros, which has been known since the great sculptors of antiquity carved their matchless statues.

Other Industries. The manufactures of Greece are of very little importance. Cloth and carpets are woven in the homes of the peasants, and there are occasional silk mills, flour mills or machine shops, but that is practically the extent of manufacturing. Nor does it seem possible, considering the absence of coal and of rivers to furnish water power, that manufactures can increase largely. Shipbuilding, however, is carried on in all the ports, for the Greeks are among the world's most enthusiastic seafarers, and large fleets of privately owned ships constantly sail the Aegean.

Transportation and Commerce. To the Greeks the natural means of transportation is the sea and not the railroads, for few places in the entire country are more than forty miles from the coast. Railroads, therefore, are few, and in the entire country aggregate less than 1,000 miles. But ships, as stated above, are numerous, and by means of them easy communication is maintained with the rest of Europe. It was believed that the canal across the Isthmus of Corinth, completed in 1893, would be a wonderful help to commerce, but it has not been much used because of its narrowness and the strong currents which flow through it (see CORINTH).

The commerce of Greece is not large, amounting in a year to less than $60,000,000. The imports slightly overbalance the exports, and Great Britain has the larger part of the import and the export trade. Currants form about one-fourth of the exports, and wheat more than that proportion of the imports.

Education and Religion. Though Greece has a system of schools which includes elementary and intermediate departments and a national university at Athens, education is by no means widespread, for the people are slow to avail themselves of their opportunities. The percentage of illiteracy of those over ten years of age is fifty-seven, as compared to 7.7 per cent in the United States and eleven per cent in Canada, but conditions are gradually improving. There is a compulsory education law, but in the country districts it is not well enforced.

There is a state religion—Greek Catholicism or Orthodoxy—and the king is the head of the Church, but complete freedom of worship is allowed. The Holy Synod, a permanent council which meets at Athens, manages the affairs of the Church.

Government. The government of Greece is a constitutional monarchy, the office of king being hereditary. There is but one legislative body, a House of Representatives of 235 members, which is chosen by popular suffrage and is known as the *Boule*. To aid the king in all his executive functions there is a ministry composed of the heads of the six state departments, and any male subject is eligible to any office; but the government is not as democratic as it would seem from this description, for promotion is largely by favor and a disinterested election in which people vote for the candidates whom they believe the country really needs is almost unknown.

Physical Features

There is a very special fitness in bringing the discussions of the geography and the history of Greece as near together as possible, for the two are closely related. It is impossible even to imagine what the history of the country would have been had land communication been easier and sea communication been more difficult, but it is certain that it would have been very different.

Coastal Peculiarities. The first point that strikes an observer of the map of Greece is the broken character of its coast, and the consequent length of shore line. Gulfs and bays penetrate far into the land, and the southern end of the peninsula, the Peloponnesus (which see), is almost cut off from the northern by the deep gulfs of Corinth and Aegina. Of all the countries of the world, Greece has the largest proportion of coast line to area—nearly 2,500 miles of coast line, or one mile of coast to every ten square miles of surface. Small wonder, then, that the Greeks have been at all times a sea-loving people. Good harbors are not numerous, though there are some excellent ones, notably Piraeus, the seaport of Athens.

Surface and Rivers. In the main, Greece is mountainous, even its islands being but the tops of submerged hills. The Pindus Mountains, running from northwest to southeast almost through the center of the peninsula,

form the watershed. To the west of these there are north and south chains divided by narrow valleys, but to the east there are east and west ranges between which lie the extensive plains which have played the chief part in Greek history. Macedonia, the plains of Thessaly, those of Thebes, of Athens, of Sparta and of Messene were the centers of ancient Greek life, the homes of the famous city-states (see subhead *The City-State*, in HISTORY division, below). Many of the mountains of Greece have special associations: Olympus was the fabled home of the gods; Parnassus, the haunt of Apollo and the Muses; Hymettus produced honey of rare quality, and Pentelicus a beautiful marble. But the mountains are worth visiting aside from their historic associations, for they have a beauty all their own. At places, where the sheer mountain-walls rise from the blue sea toward the bluer sky, the grandeur of the scenery is almost unsurpassed.

Greek rivers, too, are beautiful—rushing mountain torrents which are worthy of the legends the old Greeks wove about them; but they are too rapid for navigation, and are for the most part merely temporary, carrying water only during the rainy season, so that they are not available for irrigation. The Achelous, in the northern part, and the Alpheus, in the Peloponnesus, are the rivers of chief importance.

One of the largest lakes, Copais in Boeotia, has had a bad influence, it is believed, on the people who live near its shores. The Boeotians, in ancient as in modern times, were the slowest witted of all the Greeks, and scientists now contend that this is due to the malaria spread by the mosquitoes which Lake Copais bred. Now the lake has been drained and converted into farm land, and an improvement in the mentality of the Boeotians is looked for with confidence.

History of Greece

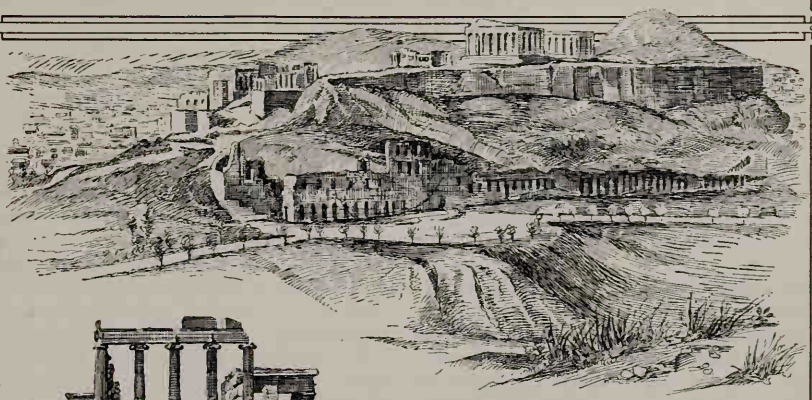
Its Beginnings. The very early history of Greece is shrouded in mists, through which only gradually gleams of light begin to break. The very oldest inhabitants of the soil, who were called by the later Greeks *Pelasgians*, were little by little assimilated by these same later Greeks, or *Hellenes*, as they called themselves, who came in from the north. Marvelous tales of the earliest age of history, the so-called Heroic Age, survive—tales of Hercules and Theseus, of the Argonauts and of Perseus, of Troy and of Thebes (all of which see); and recent excavations at Troy, at Mycenae and on the island of Crete have made it clear that this ancient time had a very real civilization, long before the Greeks came into the peninsula from the north.

Greek Middle Age. About 1200 B.C., as nearly as can be known, there began a period which lay between two ages of culture and prosperity, and thus corresponded roughly to the Medieval Age of later Europe. Its characteristic feature was the so-called Dorian migration, a movement of the rude, primitive tribes of the northern fastnesses of Greece south into the Peloponnesus. Chief of these Dorian tribes were the *Laconians*, or *Spartans*, whose main city developed into one of the two great powers of Greece. Before this sweeping wave of Dorians some of the tribes already settled in Greece were crowded out, so they crossed the Aegean into Asia Minor, where they founded those colonies which played so large a part in later Greek history. Several centuries later there was a new era of colonization, and settlements were made in Sicily and in Southern Italy, those in this latter country being so numerous that the name "Great Greece" (*Magna Graecia*) was applied to the southern part of the peninsula.

That this middle period was in no sense a "Dark Ages" must be thoroughly understood. It produced, for one thing, those great epics, the *Iliad* and the *Odyssey* (both described in these volumes), which by celebrating past glories helped to rouse in the Greeks a feeling of nationality, which was not strong enough to prevent interstate conflict but which drew them together when any outside enemy threatened. It also saw the development from the old tribal form of government through monarchy and oligarchy toward democracy, though in no state was democracy actually achieved during this period.

The City-State. During this period there was developed that most typical of all Greek political institutions, the *city-state*. The Greek cities were the elements about which the national history centered; contests between Athens, Sparta, Thebes and the lesser cities fill old Grecian chronicles. They were not, however, such cities as those of the modern world. Each city with its surrounding territory was in effect a nation, very small but entirely self-

"THE GLORY THAT WAS GREECE"



The Acropolis, or Citadel, of Athens
Here were once some of the world's most beautiful buildings

The Erechtheum

The Porch of the Maidens (Caryatides)
Location shown on left of picture above

The Parthenon
Probably the most perfect building ever erected

The Theseum
Well preserved after nearly 2400 years

Temple to Wingless Victory
(Nike Apteros)

governing. Its citizens owed allegiance to no other powers, and it might declare war irrespective of the wishes of any neighboring city. There were other differences also. When historic Athens is spoken of, it is not simply the walled town with its Acropolis and wonderful buildings which is meant, but all Attica with its farms and villages. All the dwellers throughout such a region might have a national pride as Greeks, a sentiment of loyalty toward Greece as a whole, but their intense patriotism was toward the city: they were, for example, Athenians or Spartans first, and then Greeks. This must be understood, that it may be clear why Greece throughout antiquity was never one nation.

The Period of Glory. By the close of the sixth century B. C. the powerful city-states had developed fully, each in its own field. Sparta was a great military power. Corinth was commercially supreme, and Athens was beginning to be the center of the intellectual and artistic life (see articles on those cities). Great political advance had also been made. Draco had drawn up a code of laws at Athens, and Solon and Clisthenes had broken the rule of the old land-holding nobles and organized the first democratic government of the world. But it was war which brought Greece to the height of its glory—war with a great foreign power.

The Persian Wars. The Ionian cities which had been planted in Asia Minor had kept up their connection with the mother country, but they had come in 546 B. C. by conquest under the rule of Persia. So severe was this rule that the cities revolted in 499 B. C., and Athens sent them aid in their unsuccessful insurrection. For this act Darius, the Persian king, decided that Athens must be punished. So determined was he not to let his wrath die down that he commanded a servant to repeat to him three times each day, "Master, remember the Athenians."

In 492 B. C., therefore, Darius dispatched an army into Greece under his son-in-law, Mardonius, but a storm off Mount Athos destroyed the Persian fleet, and the army suffered so severely during its progress through Thrace that the expedition was abandoned. Unappeased, Darius sent out another force two years later, but this army encountered the Athenians on the plain of Marathon (which see) and was overwhelmingly defeated. This victory, one of the "fifteen decisive battles" of the world, gave confidence to the Greeks, and raised Athens to the position of acknowledged headship among the Greek states. See Fifteen Decisive Battles.

Themistocles (which see), realizing that Persia had not yet given up the struggle, persuaded the Athenians to increase their navy, on which he felt Greece must of necessity depend in any future conflict. Events proved his wisdom, for in 480 B. C. Xerxes, the son of Darius, undertook to carry to success his father's project. With a land and naval force which the ancients estimated at more than 2,000,000, but which authorities believe to have included only about 300,000 actual warriors, he crossed the Hellespont and marched through Thrace and Macedonia. Laying aside their jealousy, Sparta and Athens summoned a congress of the states at Corinth, and a number of the cities were represented and agreed to help in the struggle.

In a series of battles which included the heroic, but for the Greeks, disastrous stand at Thermopylae (which see), the great naval engagement at Salamis (which see), and the battle at Plataea, Xerxes attempted to crush the Greeks, but their heroism and patriotism were in the end triumphant, and the Persian hosts were compelled to withdraw to Asia.

For half a century after the close of the Persian wars Greece had peace, and the city-states had leisure to develop their differing types of civilization (see Athens; Sparta). Because of its naval leadership during the war, Athens was the dominating power in the peninsula, and reached a height at which the world still marvels. Its democratic ideas were widely adopted by the other states, but Sparta held firmly to its old aristocratic government.

Period of Decline. The old rivalry between Athens and Sparta, which had been almost forgotten during the Persian wars, flamed up again when there was no great need for harmony, and in 431 B. C. Sparta found in the relation of Athens to its allied states an occasion for war. In the resulting struggle, known as the *Peloponnesian War,* Pericles, the great Athenian statesman, held his people back from land battles, in which they were no match for the Spartans, but attempted to destroy the commerce of the Peloponnesus and to gain possession of the coast towns and islands. Sparta, in the meantime, did its best to induce the colonies of Athens to revolt, and sent expeditions to ravage Attica. The Athenian plan worked well until a terrible plague broke out in the city and carried off at least a fourth of the population. Pericles was one of the

victims, and there was no one who could take his place. For twenty-five years the struggle went on, Athens almost constantly losing ground, but determined not to give up. The expedition to Sicily in 415 B. C. under Alcibiades (which see) and Nicias turned out so disastrously that Sparta thought its victory was won, but the Athenians held out until 404 B. C., when they were compelled to accept the most humiliating terms of peace.

Sparta was now the head of the Grecian states, and it proved such a hard master that at length the other states revolted, under the leadership of Thebes (see EPAMINONDAS). The Spartans were defeated at Leuctra in 371 B. C., and until 362 B. C., when Epaminondas was killed, Thebes was the foremost state in Greece.

Period of Foreign Rule. To the north of Greece a strong ruler, Philip of Macedon, had firmly established his kingdom, and in the disturbed conditions in which the Greek states found themselves, he was able gradually to extend his power southward. Demosthenes at Athens thundered against him in his *Philippics*, and at length the Greeks roused themselves to resist the invasions. At Chaeronea in Boeotia they were defeated in 338 B. C., and Greece became a part of the Macedonian Empire. The Macedonians were themselves a Hellenic people, and the Greeks were not brought into entire subjection because their intellectual superiority was clearly recognized by Philip and by his greater son, Alexander the Great.

After the death of Alexander the Greek states had a troubled existence, struggling constantly but vainly to throw off the yoke of Macedonia, but in 146 B. C. they passed under the rule of another conqueror. With the capture and burning of Corinth in that year Rome became supreme over the Greek states, and for a time they prospered under a mild and just government. A revolt in 22 B. C. brought down on them the vengeance of Rome, and several of the great cities were practically destroyed. From that destruction they never entirely recovered, though under the Roman emperors Greece regained a certain prosperity and was recognized as an intellectual center. Christianity made rapid progress, and the picturesque paganism gradually died out. New importance came to the province when, in A. D. 330, Constantine the Great moved his capital to the old city of Byzantium, which he rechristened Constantinople (see CONSTANTINE). In 395 the Roman Empire was divided into the Eastern and the Western empires, and Greece was a part of the former until the fall of Constantinople in 1453 (see BYZANTINE EMPIRE) gave the country to the Turks.

Under the Turkish rule, which lasted almost four centuries, the Greeks sank into a pitiable condition, but their devotion to their Church and their interest in the local self-government that was allowed them helped to preserve their feeling of nationality. In the early years of the nineteenth century this feeling seemed to grow more intense, and in 1821 a war for independence broke out under Alexander Ypsilanti. To check the revolt the Turks resorted to their usual weapons, massacre and wholesale execution, nor were the Greeks much more humane in their methods. Champions of the determined people sprang up on all sides, the English poet Byron being the most notable, and in 1827 England, Russia and France gave Greece their open support. The great naval Battle of Navarino, fought on October 20, 1827, resulted in the complete defeat of the Turkish fleet, and Greece became an independent kingdom.

The Modern Kingdom. In 1832 Otto of Bavaria was made king, and while his rule was far from despotic, the Greeks were much disappointed because he did not proclaim a constitution as they had expected him to do. He was forced in 1843 to yield to the strong popular demand, and a constitution went into effect the next year. This did not lessen Otto's unpopularity, however, and in 1862 he was compelled to abdicate, largely because he had not taken an active part in the Crimean War and won for Greece an increase in territory. Prince George of Denmark was chosen by the national assembly as king, and in 1863 he began his reign, which continued for half a century. In 864 England gave up to Greece the Ionian Islands, and after the Congress of Berlin in 1878 the country was further enlarged by the accession of Thessaly.

In January, 1897, Greece went to the aid of the Christians in Crete who were rebelling against Turkish rule and seeking annexation to Greece, and the result was complete defeat for the Greeks. They were compelled to pay a huge indemnity to Turkey, and to give up their claims on Crete, which did not come under the Greek flag until 1913, after the Balkan wars. This struggle broke out in 1912 between Turkey and the Balkan states, and Greece profited largely by the success of the

latter, gaining not only Crete but many other islands in the Aegean which had been a part of historic Greece, and much of Macedonia besides. The cost was great, both in money and in men, and the exhaustion which resulted had much to do with the attitude of Greece during the War of the Nations.

On March 18, 1913, while on a tour of inspection, King George was assassinated at Saloniki, and his son, Constantine I, came to the throne. The country was confronted with a serious problem on the outbreak of the War of the Nations in 1914, but declared at once its absolute neutrality.

The position of Greece in connection with the war was exceedingly embarrassing. The queen is a sister of the German emperor, and the royal family therefore leaned strongly towards the cause of the central empires, Germany and Austria. The majority of the people were in sympathy with the entente allies; this was but natural, because France and England had by treaty guaranteed protection to Greece against foreign invasion.

When Serbia was overwhelmed by the Teutonic forces in 1916 that unhappy little country looked to Greece for support, for after the Balkan wars the latter had pledged its military strength to support the former against alien enemies. However, Greece ignored the plight of Serbia, and there were strong indications that King Constantine would resist no pressure that Germans might bring to bear upon him. Internal affairs grew serious, for a strong element of the people, headed by former Premier Venizelos, resisted what was termed a disregard of the will of the people, and Venizelos and his followers revolted. They retired to a neighboring island and organized a provincial government, ready to strike against the king should it become advisable.

The military forces of the entente, by right assumed because of treaty obligations, took extreme measures to insure the continued neutrality of Greece. Men were landed from warships, and allied vessels blockaded the coasts. Constantine was commanded to demobilize his army and to deliver artillery to the allies as a guarantee that neutrality would be preserved. He failed to keep promises made, and on June 12, 1917, the allies deposed him, for at least the duration of the war. His second son, Alexander, was made king; the crown prince, having the same German sympathies his father had shown, was denied the crown. Alexander was known to be pro-ally. See WAR OF THE NATIONS. W.L.W.

Consult Grote's *History of Greece;* Tennent's *History of Modern Greece* (146 B.C.-A.D. 1820); Martin's *Greece of the Twentieth Century.*

Related Subjects. The following articles in these volumes will throw much light on the history and life of Greece. The articles on ARCHITECTURE and SCULPTURE should also be consulted. For the literary references relating to the country, see DRAMA, POETRY, etc.

CITIES AND TOWNS

Agrigentum
Athens
Corinth
Delphi
Marathon
Missolonghi
Mycenae
Piraeus
Sparta
Thebes

DIVISIONS

Arcadia
Attica
Boeotia
Epirus
Laconia
Macedonia
Messenia
Peloponnesus
Thessaly
Thrace

HISTORY

Actium
Alcibiades
Alexander the Great
Arbela
Archon
Aristides
Balkan Wars
Bozzaris, Marco
Byzantine Empire
Cimon
City States
Civilization
Clisthenes
Codrus
Constantine I
Darius
Demosthenes
Draco
Epaminondas
George I
Helots
Hipparchus
Leonidas
Lysander
Miltiades
Nicias
Oracles
Ostracism
Otto I
Pelopidas
Pericles
Phocion
Pyrrhus
Solon
Themistocles
Thirty Tyrants
Troy
Venizelos, Eleutherios
Xerxes

ISLANDS

Aegina
Crete
Cyclades
Delos
Euboea
Ionian Islands
Ithaca
Melos
Salamis
Scilly Islands

PEOPLES

Achaeans
Aeolians
Dorians
Ionians

PHYSICAL FEATURES

Acheron
Aganippe
Helicon
Mars Hill
Olympia
Olympus
Parnassus
Tempe, Vale of
Thermopylae

UNCLASSIFIED

Acropolis
Alexandrian Age
Areopagus
Festivals
Greek Literature
Isthmian Games
Mysteries
Mythology
Nemean Games
Olympian Games
Pythian Games
Stadium

OUTLINE AND QUESTIONS ON GREECE

Outline

I. Location and Size

(1) Easternmost of European peninsulas
(2) Surrounding waters and islands
(3) Size after 1913—45,000 square miles

II. Physical Features

(1) Coast line
  (a) Longest in proportion to area of any country
(2) Surface characteristics
  (a) Largely mountainous
    1. Effects of this fact on history
(3) Waters
  (a) Turbulent character of rivers
  (b) Malarial lake of Boeotia

III. Ancient Greece

(1) Lack of national unity
  (a) Effect of geography in this
(2) The people
  (a) Four tribes
  (b) Love for beauty
    1. Great works of art
  (c) Religion or mythology
  (d) Education
    1. Athenian standard
    2. Spartan standard
  (e) Slavery

IV. Modern Greece

(1) The people
  (a) Change for the worse during years of subjection
  (b) Opposite change since independence
(2) Industries
  (a) Agriculture
    1. Currant and olive
    2. Wheat
  (b) Mining
  (c) Unimportant manufactures
(3) Transportation and commerce
(4) Religion, education and government

V. History

(1) Early periods of migration
(2) The wonderful years
  (a) Persian wars
(3) Downfall of Athens
  (a) Peloponnesian War
(4) Subjection to foreign powers
  (a) Macedonia
  (b) Rome
  (c) Turkey
(5) The modern kingdom
  (a) Independence secured in 1827
  (b) Activities of the nineteenth century
  (c) Balkan Wars
  (d) War of the Nations

Questions

Name an ancient Greek slave who became famous. How did he gain his fame?

What geographic cause accounted for the stupidity of one group of the people?

What helped the people to preserve a feeling of nationality during the centuries of Turkish domination?

How did the Spartan ideal in education differ from the Athenian?

If the coast line of the United States were as long in proportion to area as that of Greece, how long would it be?

Why would the proverb "Handsome is as handsome does" have seemed foolish to an ancient Athenian?

Why has not the Corinth Canal been as great an aid to commerce as it was expected to be?

Why does the word *Thermopylae* stir the blood of a Greek?

What did the Greeks call all non-Greeks? What did the word mean?

Why does it seem unlikely that the manufactures will ever increase in importance?

Who took as his watchword "Remember the Athenians," and what did it mean?

How did the geography tend to make of ancient Greece many small countries instead of one large one?

GREEK CHURCH, the religious organization formerly comprised in the Greek, Greco-Roman, or Roman Empire and of countries evangelized from it, which include Russia. Frequently it is called the *Eastern Church* to distinguish it from the Western, the Latin, or the Roman Catholic Church. Its official title is the Holy Orthodox Catholic and Apostolic Church. The Greek Church comprises three branches: the church in the Turkish Empire, the church in Greece and the Russo-Greek Church of the Russian Empire. In point of numbers and historic memories the Orthodox Church in Turkey is the richest. It is ruled by the patriarch of Constantinople, with the subordinate patriarchs of Jerusalem, Antioch and Alexandria, who are the highest officers of the Church. The Greek National Church is governed by a holy synod. There are branches also of this Church in Rumania, Bulgaria and Serbia. The joint Greek Church has a large following in the Church in Russia and uses the old Slavonian tongue in its ritual.

History. The estrangement and separation of the Greek and the Roman Catholic Churches had its beginning in the political division of the Roman Empire and the founding of Constantinople; but it was not until the ninth century that the "great schism," or splitting of the Church into factions, began. Photius, who succeeded Ignatius as patriarch, called a synod in Constantinople in 867 and ruled that the Bishop of Rome, by that time called the Pope, should not be supreme, and denounced as heresy the insertion in the Nicene Creed of the word *filioque,* meaning *and from the Son.* He also denounced the prohibition of priestly marriage. After his death in 891 the churches were reunited until the eleventh century. The final division was that between Pope Leo IX and the patriarch Cerularius in 1054, since which time the Roman Catholics regard the Greeks as outside the Roman Catholic Church, while the Greeks maintain they have been faithful to the usages and creed of the Roman Church.

Founding of Russian Church. The Russian Church was founded in 1582-1589, when a patriarchate of Moscow was instituted, and its independence was completed by the permanent holy synod.

Church Constitution. While the higher clergy consists of patriarchs, archbishops and bishops, the recognized temporal head of the Greek Church was the czar of Russia, prior to the revolution of 1917 which dethroned him. The patriarch of Moscow succeeded him. The seven rites of the Roman Church are admitted, namely, Baptism by triple immersion, Confirmation, the Eucharist, Penance, Extreme Unction, Holy Orders and Matrimony, but these vary largely in their observance. The Cross is the only graven image permitted, but the veneration of pictures is allowed. Celibacy is obligatory for bishops, but priests and deacons may marry once only. Singing is allowed only by male voices in church services, and the ceremonial is exceedingly formal. The total membership of the Greek Church is about 119,300,000. See RELIGION, subhead *Religions of the World.* A.E.R.

GREEK FIRE, a chemical compound which, when touched by water, would burst into flames almost impossible to extinguish, was employed by the Byzantine Greeks of the Middle Ages to set fire to enemy fleets and to repel the besiegers of Constantinople. It was forced through tubes in a stream of living fire, thrown from ladles or poured from caldrons. Its composition was a secret, and modern chemists can only surmise what substances formed it. One theory is that quicklime was added to some of the incendiary compounds of which the principal ingredients had been known before the Christian Era. Sulphur, pitch, charcoal, naphtha or petroleum, tallow, rosin and turpentine were among the materials of the earlier mixtures, generally known as *wildfire* and erroneously called Greek fire by the Crusaders, though lacking the qualities of the dreaded Byzantine flame. Saltpeter was added to wildfire, and, perhaps to Greek fire, in the thirteenth century, so that they differed only slightly from gunpowder, then unknown.

Liquid Fire, a German device in the War of the Nations, resembling Greek fire mainly in its effects, is described in its proper place in these volumes.

GREEK LANGUAGE, a branch of the Indo-European family of languages, akin to Sanskrit and Latin and to the languages of the Teutonic races. In its classic form it is considered to have been the most beautiful and perfect language ever spoken, not only by reason of its musical character, but because the large number of word forms made possible a precision in expression not to be had in any less inflected speech. For instance, in the classic Greek a fully conjugated verb possessed 507 different forms.

Ancient Greek. The geography of Greece influenced not only the history of the country,

but its language as well. The mountains which cut off one little group or region from another were barriers to the growth of a common language, and thus a number of dialects were in use in Greece before the dawn of the historic period. These seem never to have been so distinct, however, that inhabitants of one region could not understand those of another. The dialects of historic times are usually grouped under three main divisions—Doric, Aeolic and Ionic, this latter including Attic. The two former were more harsh and uncultivated than the Ionic, which with the Attic was the chief literary language. The poems of Homer are the oldest writings in the Ionic dialect, but Homer's language was never a vernacular—the speech of one locality; it was always a purely literary language. Later, the greatest of Greek writers, Aeschylus, Sophocles, Euripides, Xenophon, Plato, used the Attic dialect, and this has been adopted by scholars as the standard of the ancient and classic Greek.

Still later there arose a slightly modified Attic, known as the "common dialect," which the conquest of Alexander the Great made widely prevalent. Plutarch and Lucian used this form, and the New Testament was written in it.

All the alphabets of modern Europe may be traced back to the Greek alphabet (see ALPHABET), which was in its turn derived from the Phoenician. Just when it was introduced is not known, but there are inscriptions which date from the seventh century B. C. There were changes and developments in the alphabet after its adoption, but as finally worked out it consisted of twenty-four letters. Most of the consonants were pronounced much like their English equivalents, but the vowel sounds more closely resembled the German. Greek had also the so-called "rough breathing" and "smooth breathing" marks, and three accents. These did not, like an English accent mark, indicate stress, but voice pitch. Originally, Greek writing, like the Phoenician, was from right to left, later the direction alternated, "as an ox plows," but from 500 B. C. a uniform direction from left to right was followed.

Modern Greek. The modern period of the Greek language is generally considered to have begun about A. D. 800. Considering the fact that the changes which differentiate modern Greek from the old "common dialect" have been over a thousand years in the making, they are not extreme. They do affect the language in almost every department, however—in pronunciation, in inflection and in vocabulary. Just how great the differences in pronunciation are it is impossible to determine, for scholars are by no means agreed as to the exact pronunciation of classical Greek; but it is certain that six vowels and diphthongs which anciently stood for different sounds are now pronounced alike. As to syntax, the change has been from the old, fully-inflected, or *synthetic*, character to the *analytic;* that is, many old inflections have been lost, and their places taken by auxiliary words. The change in vocabulary has consisted largely in the additions of words from other languages; but since modern Greece became again an independent nation its writers have united in an effort to banish these borrowed words and to return in other ways to the usages of classic Greek. Incredible as it may seem, an educated Greek of the time of Pericles (which see), if he could return to earth, could read without great difficulty a Greek book published in the twentieth century.

As a Study in Schools. Greek, even more than Latin, has lost much of its popularity as a study in schools of every grade. About 1550 no less famous a person than Rabelais wrote to a friend that Greek was "that without which it is a disgrace for a man to style himself scholar." Much of the preëminence then granted to Greek still remains in European universities; there the highest honors are usually reserved for students of Greek and Latin. In the United States it was equally true for many years that no man could be considered well educated unless he could read and write Greek fluently. With the development of American colleges and the broadening of their curriculums, and especially since the introduction of the elective system, Greek has lost its position as a necessary part of education. Greek is still studied in colleges and even in high schools and preparatory schools, but the number of students is falling off rapidly. Most colleges no longer require Greek either for admission or for graduation, although some colleges award special degrees, such as Bachelor of Letters or Bachelor of Philosophy, to students who have offered no Greek. In preparation for the ministry, Greek is still regarded as a requisite, but in nearly all other professions it has become of secondary importance.

The study of Greek is usually begun in the high schools with elementary work in grammar and composition, followed by Xenophon's *Anabasis* and Homer's *Iliad*. The college

courses usually begin with such works as *The Apology* of Plato, the orations of Lysias and the poems of Pindar and other lyricists, and continue with the works of Euripides, Aeschylus, Sophocles, Herodotus, Aristophanes, Thucydides and Aristotle.

Words Derived from the Greek. Modern English, as well as French, Spanish and other languages, contains many words of Greek origin. It is true that most of the Greek words in English are less frequently used than the Anglo-Saxon or even the Latin words. But in the arts and sciences the technical words are nearly all Greek or Latin, the Latin words, in turn, being frequently derived from the more ancient Greek. Such words as *homiletics, amphibian, ambrosia, amaranth* and *grammar* are all Greek in origin. W.L.W.

GREEK LITERATURE. Though written in what is known as a "dead language," because in its old form it is spoken by no nation in the present age, the literature of ancient Greece is alive as truly as are the writings of to-day, and it is far more influential than most of them. In every country and every age writers have found in it inspiration and guidance, and in certain departments its productions have never been surpassed. Though less stress is laid on the teaching of Greek literature in schools and colleges now than a generation or two ago, some knowledge of its great masterpieces is necessary to a liberal education, and the person who cannot understand an allusion to the *Iliad* or the *Odyssey* is likely to find himself seriously handicapped in reading many modern works. In such a brief treatment as this must be, it is more satisfactory to divide Greek literature into its various branches than to attempt chronological grouping.

Poetry. Almost every variety of poetry the Greeks developed to a high point of excellence. Sappho, Anacreon and Pindar wrote lyrics, exquisitely rhythmic poems which were supposed to be sung or chanted to the music of the lyre; and some of their forms and meters modern poets have found well worth imitating. Didactic poetry began with Hesiod, and has seldom if ever risen above his level—for this is not one of the highest types of verse. The great glory of Greece, however, was in its epics and dramas. It is really difficult to imagine what subsequent literature would have been had there been no *Iliad*. Vergil's *Aeneid*, Dante's *Inferno*, Milton's *Paradise Lost* and Longfellow's *Evangeline*, to mention merely the most outstanding examples, are inestimably indebted to it, as are countless shorter poems. If it had called into being but one poem, Keats' *On First Looking into Chapman's Homer*, with its haunting description of the men who—

> Look'd at each other with a wild surmise,
> Silent upon a peak in Darien,

English literature would owe it a very real debt.

In the field of drama, both comedy and tragedy were brought to perfection (see DRAMA). Aristophanes was a master of humor and satire, while Aeschylus, Sophocles and Euripides produced tragedies which, in beauty, strength and passion, still rank among the greatest in the world. Even in translation these masterpieces have a depth and dignity possessed by few more modern works.

Prose. To many a modern reader the word *prose* suggests, first of all, fiction. Of this form of literature the Greeks knew nothing, or next to nothing. Their myths were tales full of interest and charm, as many modern children can testify, and they had an occasional legend which they delighted in working up, but of stories in the sense in which they are known to-day there were none. But other forms of prose reached a high level. To Herodotus, the "Father of History," and to Thucydides and Xenophon modern historians have looked, not only for much of their ancient material, but for inspiration and for suggestions as to manner. Plato and Aristotle produced philosophic writings which were the world's textbooks for centuries, and no modern philosopher is unaffected by them; while Greek orators, notably Demosthenes, left practically nothing for later orators to achieve.

Later, when Alexandria in Egypt became the center of Greek culture, prose and poetry of many forms were produced, but much of it was of a quality inferior to that of the earlier periods. The great Alexandrian Library (see ALEXANDRIA) was a spur to writers, and history, scientific treatises, epics, lyrics and philosophic works were poured forth. Euclid, Archimedes, Josephus, Plutarch and Ptolemy flourished in this period, but of most of these it may be said that it is the content rather than the form of their writings which makes them valuable, and that in a measure shuts them out of the province of fine literature.

In these volumes there are articles on all the Greek writers named above, and a comprehensive view of Greek literature may be gained by reading them in connection with this article. Consult Wright's *A Short History of Greek Literature;* Carpenter's *Long Ago in Greece.*

GREE'LEY, Colo., the county seat of Weld County, located in one of the most fertile irrigated farming sections in the state, fifty-two miles north by east of Denver, and fifty-three miles south of Cheyenne. It is on the Cache La Poudre, South Platte and Thompson rivers, and on the Union Pacific, the Colorado & Southern and the Denver, Laramie & Northwestern railroads. The area of the city is nearly four square miles. The population, which in 1910 was 8,179, in 1916 was 11,420, by Federal estimate.

Greeley is situated on the great plains at the base of the Rocky Mountains, which are about forty miles distant. Melting snows of the mountains, retained in great reservoirs, furnish water for extensive irrigating projects in this section. The land is well suited to the raising of sugar beets, potatoes, peas, onions and cabbages. One of the largest sugar-beet factories in the state is located here, and this and two others in the same county produce an annual output valued at $5,000,000. Flour mills, elevators and vegetable-canning factories are other important enterprises. Sugar beets and field peas are also grown for feed for cattle and sheep, which are raised in considerable numbers. Near the city there are rich coal fields.

Greeley is the location of a state normal school. Among the more prominent buildings are a Federal building, erected at a cost of $150,000, a county courthouse costing $400,000, a Y. M. C. A. building, a library and three hospitals. Island Grove is a municipal grove of forty acres. Estes National Park, a favorite tourists' resort, is about fifty-five miles west.

Greeley was founded in 1870 by a colony from New England and New York under the direction of Nathan Cook Meeker, agricultural editor of the New York *Tribune,* and the town was named in honor of Horace Greeley, founder of that paper. The organization of colonists, then called the Union Colony of Colorado, still survives and holds reversionary rights in all places where intoxicating liquors are handled. Greeley was chartered as a town in 1871 and as a city in 1886. J.F.Mc C.

GREELEY, Horace (1811-1872), America's most famous jornalist, the founder and first editor of the New York *Tribune,* and the most influential of that famous group of American editors who represented the "old school" of journalism. His position as a molder of public opinion, especially during the last two decades before the War of Secession, is fittingly summarized in Whittier's characterization of him—"our later Franklin." Horace Greeley was born in Amherst, N. H., on February 3, 1811. He was reared in poverty, and received only a common school education. When a lad of fifteen be became an apprentice in a newspaper office at East Poultney, Vt., learning there his first lessons in the profession that was destined to bring him into national prominence.

HORACE GREELEY
Probably the greatest editor America has produced.

In 1831 Greeley appeared in New York City, with ten dollars in his pocket and a bundle of clothes swung over his shoulder. After supporting himself for two years by doing job work in various printing offices, he founded, with two friends, the *Morning Post,* the first two-cent daily ever published. It was a financial failure, running only three weeks after January 1, 1833. In March, 1834, its successor, *The New Yorker* appeared; this was a weekly literary newspaper that enjoyed wide popularity during its seven years of existence.

In 1840 Greeley began the publication of *The Log Cabin,* a weekly campaign paper that gave brilliant support to the candidacy of William Henry Harrison, the Whig nominee for the Presidency. The following year this paper was merged with *The New Yorker* into the *Weekly Tribune,* a periodical which had readers throughout the northern half of the Union from Maine to Oregon, and which wielded an influence unheard of up to that time. Through its columns Greeley urged the people to oppose the extension of slavery, and because people believed in him he became a mighty force in strengthening the anti-slavery sentiment throughout the North. In April, 1841, he issued the first copies of the *Daily Tribune,* which is still published in New York City. In this paper he vigorously preached the doctrines of the protective tariff and anti-liquor legislation.

Greeley's commanding position in journalism made him a prominent figure in national politics; he was one of the founders of the Republican party and a delegate to its first national convention, where he used his influence to secure the nomination of Lincoln. While he

was a loyal supporter of the President during the war, he was willing to end the struggle by compromise, and in 1864 went to Canada to confer with several Confederate agents on the subject of peace, but the effort was fruitless. When the war was over he urged the granting of a universal pardon to those who had taken part in it, and was one of the signers of the bail bond of Jefferson Davis (which see).

Greeley's interest in politics continued until his death. He was a severe critic of President Grant's administration, and in 1872 was nominated by the Liberal Republicans (see Political Parties in the United States) for the Presidency. The Democratic party, which adopted the platform of the Liberal Republicans, made him their candidate as well, but in the election Grant won a decisive victory. Worn out by the excitement and suspense of a strenuous campaign and crushed by the death of his wife, Greeley became seriously ill soon after the election, and died on November 29, 1872. Thousands viewed his body, which lay in state in the City Hall in New York, and his funeral was attended by men of national eminence, including the President and Vice-President of the United States. He had many enemies, but no one could fail to honor him for his upright life, his justice and his moral integrity.

Greeley was well known as a lecturer and writer, and he traveled widely in Europe and in America. His publications include *Hints Toward Reforms, Glances at Europe, Overland Journey to San Francisco, The American Conflict* and *Recollections of a Busy Life.*

Consult James Parton's *Life of Horace Greeley.*

GREELY, Adolphus Washington (1844-), an American soldier and scientist, whose chief claim to fame lies in his valiant service in Arctic exploration. He was born at Newburyport, Mass., and served as a Union volunteer during the War of Secession. At the close of the war he was appointed a lieutenant in the regular army and was attached to the signal service. In 1881 he commanded the expedition sent out by the United States government to establish observation stations towards the North Pole, and made many valuable scientific observations and discoveries. A detachment of his expedition reached a higher latitude than had been before attained, thus winning from England an honor held for three centuries. The non-arrival of the promised relief ships compelled Greely to move southward in 1883, and after losing eighteen of his twenty-five men he was rescued at Cape Sabine by a party under Captain Winfield Schley, afterwards prominent in the Battle of Santiago, in the Spanish-American War.

Greely was appointed chief signal officer of the army by President Grover Cleveland in 1887, and was head of the Weather Bureau from that year until it passed under the control of the Department of Agriculture. During the Spanish-American War he was in charge of cable censorship. In 1906, with the rank of major-general, he was in command at San Francisco after the fire, and in 1907 he quelled without bloodshed a Ute Indian disturbance in Wyoming. In 1908 he reached the age limit for active service and was retired. He became a member of the International Colonial Institute, and on seven occasions represented his country abroad, the last time as military ambassador at the coronation of George V. His publications include *Three Years of Arctic Service, Handbook of Polar Discoveries* and *American Weather.* See Polar Explorations.

GREEN, one of the colors of the solar spectrum, appearing between blue and yellow. Green is one of the most common colors in nature; the grass and nearly all foliage is green. We speak of "green sea water," and in the mineral kingdom we find green in malachite and in the emerald. Many tropical birds have beautiful green plumage and the wings of some species of South American butterflies are gaudy with hues of this same color. Green is the national color of Ireland, and in the past Lincoln green was worn as a mark of distinction by the Scotch highlanders. Green is worn on Saint Patrick's Day, March 17. It is the sacred color of the Mohammedans, who carry the green flag, and the background of whose prayer rugs is always green, let the design worked into the fabric be what it may. Traditionally green is the color of repentance.

Green pigment can be made by mixing blue and yellow pigments, but most of the green paints and dyes, such as Paris green, emerald green and imperial green, are made by boiling copper acetate in a solution of a compound of arsenic and oxygen. Such paints and dyes are deadly poisons, and they should be handled with care and always be kept out of the reach of children. Most of the green dyes formerly made from vegetable compounds are now derived from coal tar. The numerous tints and hues are formed by mixing the pigments in varying proportions. Most green pigments

fade quickly when exposed to the sun. See colored chart, in article COLOR.

Because green is the color of growing and immature plants, the term is occasionally applied to persons. When so used *green* means lacking in knowledge and experience. The city boy says the country boy is *green* because he does not know city ways, but when the city boy visits his country cousin he is just as *green* on the farm as the cousin is on the streets of a great city.

GREEN, ANNA KATHARINE. See ROHLFS, ANNA KATHARINE GREEN.

GREEN, HETTY HOWLAND ROBINSON (1835-1916), an American financier, at the time of her death the richest woman in America. She was born at New Bedford, Mass., and was educated at Mrs. Lowell's School in Boston. In 1865 her father died, leaving her a large fortune, and two years later she married Edward H. Green of New York, who died in 1902. Though accounted to be the world's greatest woman financier, her manner of living was simple in the extreme. There was scarcely a colossal corporation or business enterprise of great importance anywhere in the world in her day in which she did not have an interest, and her real estate holdings in Chicago, New York and other cities were enormous. Her business, as well as her property, always remained under her personal management.

Edward H. Green, born in 1868, only son of Hetty Green, has achieved success in railroad enterprises in the Southwest, particularly in Texas.

GREEN, JOHN RICHARD (1837-1883), an English historian, was born at Oxford and graduated from Magdalen College, in that city, in 1859. His first important historical work, *A Short History of the English People,* while not absolutely authentic in detail, presents a vivid panorama of the past, and is the basis of his enduring fame. Its publication met with immediate success, and it was later expanded into his great *History of the English People.* His second book, *The Making of England,* was a more scholarly but less popular piece of work. This was followed by *Stray Studies in England and Italy,* a collection of essays. His *Conquest of England* was published by his widow after his death.

GREEN'AWAY, KATE (1846-1901), an English illustrator of books for children, famous the world over and appreciated by young and old, for the quaint charm, simplicity and delicate humor of her sketches. Her subjects are mainly flowers and landscape. She also wrote verses to accompany her drawings. Among her most successful works are *Under the Window, A Painting Book of Kate Greenaway, Mother Goose, Language of Flowers* and *Kate Greenaways' Almanacs.* John Ruskin and leading art critics everywhere have praised highly the works of this lover of children.

GREENBACK PARTY. As a result of an excessive issue of greenbacks by the Government of the United States during the War of Secession and in the years immediately following, money was "cheap" (see MONEY), and prices were correspondingly high. Agricultural products and manufactured articles sold for more than for years previously, and it was urged that this was due to the plentiful supply of greenbacks; the opinion was doubtless strengthened by the fact that payment was nearly always made in that form of money. A close money market resulted from the panic of 1873, and the advocates of "cheap money" believed that a new issue of greenbacks would restore prosperity, especially to the farmers. Money which could be issued in unlimited quantities and which could be used in payment of all debts seemed a cure for every financial evil.

A national political organization was formed by those favoring unlimited use of this paper currency, and naturally it was called the Greenback party. The Greenbackers' platform demanded the withdrawal of all bank currency from circulation, that henceforth no currency should be circulated except government paper (greenbacks) "based on the faith and resources of the nation" (which meant fiat money), and that gold and silver should be used in payment of interest and principal on government bonds only where it was promised. The party held a national convention in 1876 and placed a Presidential candidate, Peter Cooper, in the field; it polled nearly 82,000 votes, but secured no Electoral votes. In 1880 alliance was made with the Greenback-Labor party. See FIAT MONEY; POLITICAL PARTIES IN THE UNITED STATES.

GREEN'BACKS, the paper money of the United States government, not including the gold and silver certificates, known as *treasury notes.* Greenbacks, so called because of their color, were first issued in 1862 to finance war operations. Until 1879 they were merely promises of the United States to pay, and were unsecured by metal money; at one time, when confidence in the government was slight, they

were worth only thirty-five cents for each dollar. Since then their issue has been fixed at $346,681,016, the amount in circulation at the time, and they are redeemable in gold. See SPECIE PAYMENT, RESUMPTION OF; MONEY.

GREEN BAY, WIS., the oldest city in the state and the county seat of Brown County. It is situated at the southern extremity of Green Bay, an arm of Lake Michigan, at the point where it receives the waters of the Fox River. Milwaukee is 113 miles south, and Chicago is eighty-five miles farther south. Transportation facilities are offered by the Chicago & North Western; Chicago, Milwaukee & Saint Paul, Green Bay & Western, and Kewaunee, Green Bay & Western railways; there is steamer connection with other ports on the Great Lakes during the summer season. An electric line extends through Fox River Valley to Fond du Lac, sixty-five miles southwest. The population increased from 25,236 in 1910 to 29,353 in 1916, by Federal estimate.

Green Bay is located in a popular summer resort region, the small lakes and rivers of the district providing picturesque scenery and fine boating, fishing and bathing facilities. The residence district of the city is made beautiful by wide streets with double rows of trees on either side. Six bridges span the river. Of the city's eight parks, Union Park is the largest; it contains Tank Cottage, the oldest house in the city, built in 1789. Bay View Beach, the "Coney Island" of the city, is seven miles north, and offer the amusements of an ideal beach resort. The Oneida Indian Reservation is west of the city.

Buildings and Institutions. Besides a county courthouse and city hall, the city has a $180,000 Federal building, the $150,000 Minahan Building, a fine school building and a number of handsome churches. Saint Mary's hospital, the Wisconsin Deaconess hospital, Brown County insane asylum, the county poorhouse and the Good Shepherd Home are institutions worthy of note. Besides its public and parochial schools it has Saint Joseph's Academy for girls. The Kellogg Library, containing 30,000 volumes, is the joint gift of Rufus B. Kellogg and Andrew Carnegie.

Through its harbor, which receives the largest vessels on the Great Lakes, and its exceptional railway transportation facilities, Green Bay has become one of the great distributing centers of the state. The leading export through the harbor is grain, and the largest single import is coal; there is an extensive trade in fish, and that in lumber is important. There are about forty wholesale and jobbing houses, and they do a large business in agricultural and dairy products. There are also paper mills and sawmills, canneries, breweries and manufactories of crockery, hardware and machinery. Over 2,000 people are employed in the large machine and repair shops of the railroads serving the city. Green Bay was incorporated as a borough in 1838 and as a city in 1854. In 1895 the town of Fort Howard was annexed, and in 1916 the commission form of government was adopted. H.A.

GREEN BRI'ER, the name applied to a number of plants of the genus smilax, of the lily family. The name especially relates to a greenish, prickly, climbing shrub, with thick leaves and small clusters of flowers, found in the United States and Canada. See SMILAX.

GREENE, NATHANAEL (1742-1786), a general of the Revolutionary War, known as "the man who saved the South," was born at Patowomut, R. I. During his early boyhood days he lived the quiet life of the Friends, as his father was a prominent Quaker. When the Revolutionary War clouds gathered he turned his attention to colonial defense. A slight limp in his walk was first thought to unfit him for hard service, but he rose quickly from the ranks of the "Kentish Guards" and was chosen brigadier-general. When news of the Bunker Hill battle reached Rhode Island his regiment marched to Boston, and when Washington reached Cambridge he was sent to welcome the new commander-in-chief. Washington discovered that he was a valuable officer and made him a major-general.

NATHANAEL GREENE

After the British were defeated in New York and New Jersey in 1776 and 1777, they turned their attention to the South and captured Savannah. Greene succeeded General Gates in 1780 in command of the army of the South, which had been so often defeated that it was known as "only the shadow of an army," but Greene's judgment, patience, kindness and

energy counted in this crisis. Daniel Morgan, the sharpshooter, and "Light-horse Harry" Lee were sent to his aid, and at Cowpens he defeated the British general, Tarleton, in January, 1781. One after another the British forts were captured in South Carolina. This great soldier, who had endured so many hardships in war, was counted, next to Washington, the greatest general of the Revolution.

GREENFIELD, Mass., the county seat of Franklin County, and a summer resort in the hill country of the northwestern part of the state. It is situated on the north bank of the Deerfield River, two miles above its junction with the Connecticut River, and is twenty miles south of the Vermont state line and fifty-six miles by rail west of Fitchburg. It is served by two branches of the Boston & Maine Railroad and by the Connecticut Valley electric interurban line. The population, which in 1910 was 10,427, was reported by the state census of 1915 as 12,618.

Greenfield, which includes an extensive park system, covers an area of twenty square miles. It takes its name from the beautiful green fields of its own meadow lands. Along the rivers and in the hills are a number of points of scenic interest. Many motor parties coming by way of the "Mohawk Trail" visit Greenfield during the summer. Two of the largest hotels sometimes accommodate many thousand guests each in one season.

A Federal building, erected in 1916 at a cost of $100,000, a public library, two hospitals, hotels, and banks are among the prominent buildings. There are manufactories of taps and dies, fuel stokers, cutlery, paper boxes, bricks, cement building blocks, agricultural implements and children's carriages. Settled in 1682, Greenfield was a part of Deerfield until the year 1753. G.H.K.

GREENHOUSE, a house of glass on a framework of wood, or iron and wood, used for the protection or growth of delicate plants, and of plants grown out of season. Such a building must have plenty of light, and is almost invariably glass-covered. When the heat is not sufficient for the tender plants, artificial heat is supplied. Small structures are heated with stoves, but the largest have coils of pipes carrying steam or hot water. Sometimes a series of greenhouses clustered together and heated from a central plant may cover several acres of ground.

A greenhouse used for the display of flowers, rather than their growth, is known as a *conservatory* (which see). Other places called greenhouses are *orchard houses, warm houses, bark stove houses, graperies,* etc., and those two commercially important houses, *forcing houses* and *hothouses.* In them are brought to life and bearing many out-of-season luxuries—vegetables, fruits and flowers, which bring the growers and dealers unusually high prices.

GREEN'LAND, an island lying almost entirely within the Arctic Circle, to the northeast of the mainland of North America. Next to Australia it is the largest island in the world. It is separated from the American continent by Davis Strait, Baffin Bay and Smith Sound. More than 1,400 miles long and 690 miles wide, it covers an area of 826,000 square miles, twelve times greater than the six New England states and as large as British Columbia, Alberta and Saskatchewan combined. All of Germany, France, Italy and Spain combined lack over 100,000 square miles of being as large. Yet Greenland is in most respects worthless for the purposes and necessities of man.

It is a Danish colony, and there are a few Danish settlements on the west and southeastern coasts. The interior forms a plateau with an average height of 4,500 feet, surrounded by rocky coasts rising several hundreds of feet direct from the ocean. Here and there are mountains over 10,000 feet high. Many deep fiords and bays indent the coast, which resembles that of the west of Norway. Ice covers more than three-fourths of the surface, and in some parts it is 2,000 feet thick. There are thousands of glaciers, some of them the largest in the world. The island is of volcanic formation, consisting of a mass of Archaean and igneous rocks similar to those found in Spitzbergen and part of Western Europe. At some far distant date Europe, Spitzbergen and Greenland were all connected by land which sank into the sea (see Geology).

LOCATION MAP

Climate. During the long summer day of eighteen to twenty-two hours the soil in some parts of the island, especially near the coast, produces luxuriant vegetation and flowers. The

greater part of the surface, where free from ice, is covered with moss and lichens, and here and there alder, juniper and other berries are found. The average temperature in the south of the island during summer is 48° F. In no part does the temperature rise above the freezing point, 32° F., for more than 140 days in the year, while in the north the cold is intense all the year round. The climate is very uncertain and liable to swift changes from bright sunshine to dense fogs or snowstorms.

Resources. Agriculture is impossible, but in a few favored spots a little gardening is done. The principal occupations are fishing and hunting. Cryolite, used in making aluminum, is mined and exported in quantities varying from 6,000 to 12,000 tons annually. The mining rights are held by an American company, under a charter from the Danish government. The whole of the commerce, except in minerals, is a monopoly granted to the Danish Greenland Company, with head offices in Copenhagen. Whale and seal oils, sealskins and eiderdown form the principal exports and constitute the chief form of local currency, all internal trade being conducted by barter. Government stores supply the needs of the natives and the few European inhabitants.

Government. About one-twentieth of the island is occupied by Danish settlements, and for purposes of administration the colony is divided into North and South Greenland. An inspector, appointed by the king of Denmark, presides over each district. The most important settlements are Sydproven, the largest in the island; Godhaven, capital of North Greenland; Godthaab, capital of South Greenland, and Upernivik, the most northerly civilized port in the world.

History. Greenland was first colonized by Norwegians about 983, when Eric the Red led a party of voyagers to the island. Later, probably in the twelfth century, Norsemen are supposed to have made their way from Greenland to the American continent. After having been a separate state for many years, it became incorporated with Norway in 1260. For a time Greenland received no attention, all connection with Europe having ceased, but in 1585 it was rediscovered by Davis. Numerous expeditions visited the island, but no attempt at colonization was made until the Danes established mission stations on the west coast in 1721. Recent discoveries and explorations in and around the island are described under the heading POLAR EXPLORATIONS. The population of Greenland was estimated at only 13,571 in 1911, and consisted chiefly of Christian Eskimos, with about 300 Europeans. For the manner of life of the natives, see ESKIMO. F.ST.A.

Consult Smith's *Eskimo Stories;* Mikkelsen's *Lost in the Arctic;* Nansen's *In Northern Mists.*

GREEN MOUNTAIN BOYS, a name assumed by a body of soldiers from Vermont during the Revolutionary War. They captured Fort Ticonderoga and Crown Point, and were responsible for the victory at the Battle of Bennington. They were organized originally by Ethan Allen to oppose the claims of New York to the territory of Vermont. The Green Mountain Boys were the first to ask that Vermont be regarded as a state. This was not granted until 1791, when it was admitted as the fourteenth state. See ALLEN, ETHAN.

GREEN MOUNTAINS, one of the oldest mountain ranges in North America. It belongs to the Appalachian system, beginning in the southern part of Connecticut and extending northward through the western part of that state and Massachusetts into Vermont and Quebec. The range is known as the Green Mountains in Vermont only; in Massachusetts and Connecticut it takes the name of the Berkshire Hills, Taconic Mountains and Hoosac Mountains. Erosion and weathering have worn down their peaks until in some places they are merely low, round hills. The highest peaks are mounts Killington, Mansfield, Camel's Hump, Lincoln and Jay; the greatest elevation is in Mansfield Peak, Vermont, 4,279 feet. The highest point crossed by a railroad is the small village of Summit in Rutland County, Vermont. Some of the best building stone in the country is found in the Green Mountains. The forests of hemlock, fir, pine, spruce and other evergreens have given the name to this range. The Green Mountains are much frequented in summer by tourists, who are attracted by the beautiful scenery and pleasant climate.

GREENOUGH, *green'o,* HORATIO (1805-1852), an American sculptor and art critic, was born at Boston, Mass. He was a Harvard graduate, and during his college days devoted himself especially to the study of anatomy. The most important works of his early career were a bust of Washington modeled from Stuart's portrait, and the design from which the Bunker Hill Monument was constructed. During the latter part of his life he had his studio in Florence, where he did his best work, includ-

ing a colossal statue of Washington, now in the Capitol at Washington. Here are also to be found his groups of *The Rescue,* which took him eight years to complete. Among the well-known Americans who sat for portraits to him are John and John Quincy Adams, Henry Clay, John Jacob Astor and John Marshall.

GREEN RIVER, an important tributary of the Ohio River, rising in Lincoln County, near the center of the state of Kentucky. It flows west and northwest until after a course of 300 miles it joins the Ohio about eight miles from Evansville. It is navigable for small vessels for about 200 miles, with the aid of locks and dams. Green River passes close to the mouth of the Mammoth Cave (which see) and receives the waters of the Echo River, which flow through an underground passage from the cave.

GREENSBORO, N. C., one of the progressive cities of the New South, situated northwest of the geographical center of the state, in Guilford County, of which it is the county seat. It is eighty-one miles northwest of Raleigh, the state capital, and on the Southern Railroad. The place was settled in 1808, was chartered in 1870 and was named in honor of General Greene, who commanded the Continental army in the Battle of Guilford Courthouse (March, 1781). Since 1911 the commission form of government has been in operation. The population has grown steadily; in 1916 it was estimated by the Census Bureau to be 19,577, an increase of 3,682 since 1910. The area of the city is four square miles.

The region in which Greensboro is located is rich in tobacco, fruit and grain, and the city has a considerable trade in these and its manufactured products, which include cotton goods, cotton-mill supplies, carpets, fertilizers, furniture, stoves, tiles and buggies. Iron, copper and gold are also found in this locality, and the city has a large blast furnace. In its territory, Greensboro is noted as an educational center, being the seat of Greensboro Female College (Methodist Episcopal South), opened in 1846, and the State Normal and Industrial College, for white students. For colored students the city has the Bennett, the Lutheran and the State Agricultural and Mechanical colleges. There are two parks, several hospitals, a public library and a Masonic Home.

GREENSBURG, Pa., the county seat of Westmoreland County, situated in the southwestern section of the state, thirty-one miles southeast of Pittsburgh and on the Pennsylvania Railroad. Electric lines connect with cities south, and through Pittsburgh with cities west. The people are engaged in coal mining and in making glass, iron and brass products and steam-heating apparatus. Saint Mary's and Saint Joseph's academies, in addition to the public schools, offer educational advantages. The borough was settled in 1784, became the county seat in 1787 and was incorporated in 1799. In 1773 the first organized court of justice west of the Alleghany Mountains was held in Hanna's Town (destroyed by Indians in 1782), a few miles from the site of Greensburg. The boroughs of East Greensburg, Southeast Greensburg and Ludwick were annexed to Greensburg in 1905. In 1910 the population was 13,012; in 1916 it was 15,483, by Federal estimate. The area of the borough is nearly two square miles.

GREENVILLE, Miss., the county seat of Washington County, situated on the northwestern border of the state and on the Mississippi River. Jackson, the state capital, is 100 miles southeast, and Memphis is 139 miles north. Railway transportation is provided by the Southern and the Yazoo & Mississippi Valley railways, and there is steamer connection with the various river ports. This section of the country has a remarkable growth of cotton, and large quantities of it are shipped from Greenville. Aside from the kindred cotton establishments, cottonseed oil factories, gins, compresses, etc., saw and planing mills are the only important industrial plants in the city. Greenville was incorporated in 1870 and was chartered in 1886. In 1910 the population was 9,610; in 1916 it was 10,846, by Federal estimate.

GREENVILLE, S. C., the county seat of Greenville County, is an important cotton-textile-manufacturing city in the northwestern part of the state. It is 111 miles northwest of Columbia, the state capital, thirty-two miles west by south of Spartanburg and 160 miles northeast of Atlanta, and is on the Reedy River, near rapids which furnish power for several large mills. Transportation facilities are provided by the Southern, the Charleston & Western Carolina, the Atlantic Coast Line and the Greenville & Western railroads, and by the Piedmont & Northern interurban electric line. The population of the city in 1910 was 15,741, and in 1916 it was 18,181, by Federal estimate. It lies near many smaller towns, and covers an area of nearly five square miles.

Greenville is pleasantly located at an altitude of 1,000 feet among low, outlying hills of the Blue Ridge Mountains. It contains the Furman University (Baptist); Greenville Woman's College (Baptist); Chicora College (Presbyterian); Sacred Heart Academy (Roman Catholic), and two business colleges. The city has a Federal building, and a Carnegie Library, constructed in 1916.

Greenville is one of the largest textile-manufacturing cities of the South. Its mills operate nearly 600,000 spindles, and in them and allied industrial plants are about 7,000 employees. This city is an important cotton market for Southern mills, and contains large engineering offices which design and supervise much of the mill construction of the South. Cotton mills, bleaching mills, hardwood manufacturing plants, foundries, flour and grain mills, cigar factories, granite works and carriage and wagon works are the important industrial establishments.

Greenville was settled in 1776 and incorporated in 1831. It was first chartered as a city in 1868; the government is now administered under a charter granted in 1902. W.F.R.

GREENVILLE, Tex., the county seat of Hunt County, situated in the northeastern section of the state and on the headstream of the Sabine River, fifty-one miles northeast of Dallas. It is the junction of the Missouri, Kansas & Texas, the Texas Midland and the Saint Louis Southwestern railways, and these shipping facilities make it the trade center for a rich agricultural and stock-raising district. It is also an important cotton market in the state, and has cotton gins, cotton compresses and a cottonseed oil refinery. For higher education the city has Burleson College (Baptist) and Wesley College; one mile distant, in a community known as "Holiness people," is Holiness University, founded in 1898. Greenville was settled in 1844, was chartered as a city in 1875 and adopted the commission form of government in 1907. In 1910 the population was 8,850; in 1916 it had increased to 10,099, by Federal estimate. The area of the city is nearly five square miles.

GREEN VITRIOL, *vit'ri·ul,* another name for copperas (which see).

GREENWAY, Thomas (1838-1909), a Canadian statesman, premier of Manitoba from 1888 to 1900. He was born in England, but emigrated to Canada at an early age, and became a merchant in Ontario. From 1875 to 1878 he sat in the Dominion House of Commons, and in 1879, having in the meanwhile removed to Manitoba, he was elected a Liberal member of the Manitoba legislature. In 1887 he became leader of the Liberal opposition, and in the following year became premier. The chief events of his administration concerned the parochial or separate schools, which he succeeded in abolishing in 1890. He also secured the passage of a law abolishing French as an official language for the province. These measures excited bitter opposition throughout the Dominion, and became a national political issue (see Manitoba, subhead *History*). Greenway was succeeded as premier by Hugh J. Macdonald (now Sir Hugh). G.H.L.

GREENWICH, *grin'itch,* the English town from the meridian of which geographers of the world reckon longitude. It is situated on the right bank of the Thames, six miles southeast of London Bridge, in the County of Kent.

GREENWICH OBSERVATORY

The famous Royal Observatory, founded by Charles II in 1675, stands upon a hill in Greenwich Park. The fact that England largely influenced the scientific world at the time, and that the Greenwich Observatory then excelled all others, made it the natural choice as the center for the world's astronomical observations. Therefore the longitude of Greenwich was placed at 0°. From the clock in the observatory the time is daily flashed by electricity throughout the United Kingdom at exactly noon.

The hospital established by Queen Mary in 1705 as a home for disabled seamen, with accommodations for over 3,000, was, in 1873, turned into the Royal Naval College for the education of naval officers. The hospital was formerly a royal palace, and was the birthplace of Henry VIII, Mary and Elizabeth. Greenwich now has extensive iron foundries, engineering works, docks and shipbuilding yards. Until 1894 it was customary for the British

Cabinet to hold an annual banquet at an old-fashioned hostelry at Greenwich; this was always referred to as a "whitebait dinner," Greenwich being noted for whitebait caught in the Thames. Population in 1911, 96,000. See LONGITUDE; LONGITUDE AND TIME.

GREGO'RIAN CALENDAR. See CALENDAR.

GREGORY, *greg'o ri,* the name of sixteen Popes, at least two of whom were among the most important occupants of the Papal chair. The name has also been borne by two antipopes (see ANTIPOPE).

Gregory I, called THE GREAT (about 540-604), was of noble family and was educated not for the Church but for the law. However, he was vitally interested in religious matters, and when he came into possession of the family fortune he devoted it to the founding of monasteries. To one of these, in his native city of Rome, he retired, and there took the vows of a monk. One day while walking in the market place he saw several Anglo-Saxon youths being sold as slaves, and inquired of what nationality they were. "Angles," was the reply. "Not Angles, but angels," exclaimed Gregory, referring to their fair skin and light hair, and from that moment vowed that he would go as a missionary to Britain, the home of these beautiful youths. So highly was he esteemed in Rome, however, that Pope Benedict I would not allow him to go, and under Benedict's successor, Pelagius II, he was sent on important service to Coustantinople.

When Pelagius died in 590, Gregory was chosen Pope despite his protests, and his wise, zealous administration of his office fully justified the choice. He organized the ritual and the services of the Church, and was especially active in missionary enterprise. Augustine (which see) was sent to England on the mission which Gregory himself had so desired to undertake, and missions were also established in Sicily, in Sardinia and in Lombardy. Indeed, it is difficult to overestimate the value of Gregory's services in establishing the Church on a firm basis and in forwarding reforms among the clergy. His writings include an important *Exposition of Job* and *The Book of Pastoral Rule.*

Gregory VII, Pope from 1073 to 1085, was actuated in almost every move of his most important reign by the conviction that the Pope was the sovereign ruler in matters political as well as religious, when rulers interfered in things that were purely spiritual or ruled their governments to the detriment of their subjects. The controversy between him and the emperor on this subject made much of the history of the time. Hildebrand, as he was called before his election to the Papacy, was born in Tuscany about 1020, of a humble family, and was educated for the Church. His rise in churchly rank was steady, and his election in 1073 to the Papal chair was unanimous. One of his first acts was the prohibition of clerical marriage, and in this he met with great opposition. Not daunted, he turned his attention against the abuse of lay investiture, as it was called. That is, he forbade the people to recognize the authority of any priest or Church official who had received his office from a secular ruler. As this right of investiture had been the only hold the Emperor Henry IV had had on the clergy of his dominions, the emperor refused to abide by the Papal decrees and continued to recognize the bishops whom he himself had created. Gregory summoned him to appear in Rome, but Henry assumed a defiant attitude and declared Gregory deposed.

But the Pope had stronger weapons in his hands. He not only excommunicated Henry, but released all Henry's subjects from their allegiance to him, and the emperor realized the uselessness of resistance. To Canossa, where the Pope was staying, he went to make his submission, and in the words of Gregory himself, "having laid aside all belongings of royalty, wretchedly, with bare feet and clad in wool, he continued for three days to stand before the gates of the castle." Add to this that it was severe winter weather, and that he had to stand in the snow, and the depths of Henry's humiliation may be seen. Finally the Pope relented and absolved him, but Henry had submitted only to gain his point, and in 1080 again rebelled against the Pope and declared him deposed. While Henry was besieging Rome, Gregory shut himself up in the castle of Sant' Angelo, and though he was liberated in 1084 he was obliged to withdraw to Salerno. There, in retirement, he died, exclaiming almost with his last breath, "I have loved justice and hated iniquity; therefore I die in exile." See HENRY IV.

Gregory XIII (1502-1585) was made Pope in 1572, after he had served as theologian at the Council of Trent, as legate to Spain and as cardinal. He was especially interested in education, believing that only through its aid could the growing heresies of Protestantism be combated, and he did much to aid the Jesuits.

But his reign is of general interest chiefly because of his reform of the calendar, the Reformed or Gregorian calendar in use to-day dating from his time. See CALENDAR. G.W.M.

GRENADE, *gren ayd',* a small explosive bomb, formerly used in war by specially trained men called grenadiers. It usually consisted of a hollow ball of metal filled with gunpowder and exploded by a fuse or percussion cap. Grenades were extensively used in the seventeenth and eighteenth centuries, but during the nineteenth century were regarded as useless and obsolete. The war between Japan and Russia in 1904 saw a revival of these weapons, which were used with deadly effect during the siege of Port Arthur. In the War of the Nations, which began in 1914, grenades were important weapons in trench warfare and were used by all the armies engaged. When filled with modern explosives they are found to be very effective. To-day grenades are made of steel tubes filled with guncotton, nitroglycerine, picric acid or other explosives, and are thrown by hand or discharged by catapults into the trenches or into the ranks of opposing forces.

GRENADIER, *gren a deer',* originally one of a body of soldiers specially trained in the use of grenades, or bombs. Such weapons had been in use long before it was found necessary to organize special companies of grenade throwers, and a few years later full companies in each company of the King's Regiment of the army of France were trained as grenade throwers, and a few years later full companies of grenadiers were formed. England quickly followed the example set by France, and it gradually spread to all European armies. The grenadiers were picked men, usually the tallest in the regiment, and they wore a distinctive headdress consisting of a loose fur cap with a peak and with ear flaps. This headdress has now developed into the high bearskin hat of the British Grenadier Guards and other regiments, but this is worn only on parade.

GRENFELL, SIR WILFRED THOMASON (1865-), the guiding genius of Labrador. Whether he is acting in the capacity of medical missionary, clergyman, judge, doctor, policeman or volunteer postman, he performs his duties with a vigor and enthusiasm that has made his influence felt in every part of Newfoundland and Labrador.

Brought up in an influential English family, for he was born near Chester and was educated at Oxford and at London Hospital, he finds in Labrador "the joy of the opportunity of service." In 1889, under the auspices of the Royal National Mission to Deep Sea Fishermen, he fitted out a hospital ship and accompanied the fishermen of the North Sea on their cruises from the Bay of Biscay to Iceland. After three years in the work there, he began his activities in Labrador. Along the coast of Saint Anthony, at Battle Harbor and Harrington Harbor in Newfoundland, and at Indian Harbor in Labrador, he built hospitals, each of which is the home of a resident doctor and nurse. The mission headquarters are at Saint Anthony, where Dr. Grenfell lives; here also he established an orphanage.

WILFRED T. GRENFELL
The "good angel" of Labrador

His little hospital ship, the *Strathcona,* is his summer home, and in June of each year he starts on his cruise along 1,500 miles of a bleak, inhospitable coast, and he goes ashore at the scattered villages. He gives the royalties from his books—*Adrift on a Pack of Ice, Off the Rocks, Labrador* and *Down to the Sea* —and the income from his lectures, as well as the best of his mind and life to the fisherfolk of Labrador. In 1909 he married Anna Elizabeth MacClanahan of Chicago, Ill. R.D.M.

GRENOBLE, *gren no'b'l,* one of the strongest fortresses in France, the capital of the Department of Isere, seventy-five miles southeast of Lyons. It is beautifully situated in the valley of the Isere River, surrounded by hills and divided by the river into an ancient and a modern city. The manufactures consist of gloves, of which about 800,000 dozen pairs are produced annually, cement, liquors, straw hats, furniture and leather. In the beautiful church of Saint Andre is the monument of Bayard, the knight "without fear and without reproach" (see BAYARD, PIERRE DU TERRAIL). Grenoble occupies the site of the ancient town of Cularo, the name of which was changed to Gratianopolis by Gratian, who fortified it in the fourth century. Population in 1911, 77,438, of whom more than 18,000 were engaged in the glove industries.

GRESHAM'S LAW, the principle that "bad money drives out good," was first stated by Sir Thomas Gresham, founder of the Royal Exchange in London, in 1560. Whenever a government issues money that does not equal in value the amount marked on it, people who have good coins in their possession will save them and spend the poor money. In addition, foreign merchants will demand payment in good money, so that after a time there may be none left in circulation but the inferior issue. If coins of full weight are put in circulation with coins that are of light weight or badly worn, the good coins may be hoarded, and soon nothing will be found in the market but poor and defaced currency. This fact appears to have been first noticed in the thirteenth century, when dishonest dealers chipped off particles from gold and silver coins, which were circulated until they were so thin that they were easily broken. Gresham states the principle as follows:

> "Where by legal enactment a government assigns the same nominal value to two or more forms of circulatory medium whose intrinsic values differ, payments will always, as far as possible, be made in that medium of which the cost of production is least, the more valuable medium tending to disappear from circulation."

The most striking instances of the working of Gresham's law are found in Mexico and some of the other Spanish American countries, where paper money has caused the disappearance of all metal coins. In 1896, when there was a possibility in the United States that bimetallism might be established and that silver might circulate on a legal parity with gold, the owners of gold coins hoarded their supply until the defeat of the proposed plan at the polls. See MONEY; BIMETALISM. A.E.R.

GRET'NA GREEN, a village in Dumfriesshire, Scotland, eight miles north of Carlisle and just over the English border. It is noted for runaway marriages formerly celebrated there under the lax Scots law, which was satisfied merely with mutual promises of the man and woman made in the presence of witnesses. The fugitive lovers were united in marriage by the clergyman in very speedy manner; and the fee, very flexible in amount, was demanded when the service was about three-quarters performed, so as to insure payment before the possible arrival of irate parents. There were four places in Gretna Green where these marriages took place. However, this practice was discontinued by an act of Parliament in 1856, which declared that no irregular marriage in Scotland should thereafter be valid unless one of the parties had resided in Scotland for twenty-one days. To-day any town to which eloping couples flee to get married is popularly termed Gretna Green.

GRÉVY, *gra ve',* FRANÇOIS PAUL JULES (1807-1891), a French statesman and the third President of the French republic, was born at Mont-sous-Vaudrey, Jura. He studied law in Paris, was admitted to the bar in 1837, and became a brilliant member of the profession. In 1868 he was elected a member of the Chamber of Deputies, which corresponds to the American House of Representatives, and in 1873 became president of the National Assembly. In 1879 he was elected President of the republic, upon the resignation of President MacMahon. He entered on a second term of office in 1885, but in 1887 was compelled to resign on account of a scandal involving his son-in-law. Mr. Grévy was an able, conscientious and popular statesman, and successfully handled the problems of his administration.

GREY, *gray,* ALBERT HENRY GEORGE GREY, fourth Earl (1851-1917), a British statesman and colonial administrator, Governor-General of Canada from 1904 to 1911. Grey was educated at Harrow and at Trinity College, Oxford, where he was graduated in 1873. Five years later he was elected to the House of Commons, but was unseated on a technicality. He was again elected in 1880, and sat until 1886. In 1896 and 1897 he was administrator of Rhodesia, and he became the close friend and supporter of Cecil Rhodes in his plans for consolidating British South Africa. From 1898 to 1904 he was a director of the British South Africa Company, and from 1899 to 1904 was lord-lieutenant of Northumberland. During the seven years he spent in Canada he became very popular. He was interested in the social and economic progress of the Dominion, and took an active part in important public movements, notably the campaign against tuberculosis and the conservation movement. He sought to promote Canadian patriotism, and at the same time to stimulate the sense of loyalty to the British Empire.

For several generations Earl Grey's family has had more or less intimate connection with Canada. His sister Mary was the wife of the fourth Earl of Minto, his predecessor as Governor-General of Canada. His uncle, Henry Grey, third Earl (1802-1894), was British Colonial Secretary from 1846 to 1852. It was

due to him in no small degree that Canada won responsible government when it did. The first Earl Grey (1729-1807) was a British general who held high commands in America during the Revolutionary War, and the second Earl, grandfather of the fourth Earl, was the famous Prime Minister. G.H.L.

GREY, Charles, second Earl (1764-1845), an English statesman, whose greatest work was the passage of the Reform Bill of 1832. He was born at Fallodon, in Northumberland, studied at Eton and at King's College, Cambridge, and like most young men of his class, completed his education by traveling on the Continent. In 1786 he entered Parliament, where he at once joined Charles Fox, to whom he ever afterward remained faithful. He helped to manage the impeachment of Warren Hastings, and as early as 1797 began to bring forward petitions for electoral reform. In the "all talents" ministry of 1806 he was first lord of the admiralty, and on Fox's death Secretary of State for Foreign Affairs, and he helped to put through the bill for the abolition of the slave trade.

From 1807 to 1830 he was a member of the Opposition in the House of Lords, to which he had been admitted in 1807; but in 1830 he came into power as Premier. At once he began the struggle to put through a reform bill which should equalize suffrage and do away with the so-called "rotten boroughs," but opposition was fierce, and disturbances throughout the country were the result. Twice the bill was passed by the Commons and rejected by the Lords, and in 1832 Grey demanded of King William IV that he create enough new peers to put through the bill. William consented, but the mere threat of such action was enough to change the attitude of the Lords, and on June 4, 1832, the Reform Bill was passed.

Grey retired from office in 1834 and spent the rest of his life in retirement. While not ranking with the greatest statesmen England has produced, he holds a permanent place in the history of his country. A.MC C.

GREY, Edward, Viscount Grey of Fallodon (1862-), until 1916 known as Sir Edward Grey, a British statesman and diplomat, appointed Secretary of State for Foreign Affairs in 1905. The appointment was severely criticized at the time, for Grey was then almost unknown to the public. In 1885, shortly after taking his degree at Balliol College, Oxford, he entered the House of Commons as the Liberal member for Berwick-upon-Tweed, and from 1892 to 1895 he was Under-Secretary for Foreign Affairs in the Gladstone and Rosebery ministries. His interest in politics, however, was popularly supposed to be somewhat languid, and he was better known as an amateur tennis champion, an enthusiastic fisherman and a lover of all outdoor sports. Between 1895 and 1905, when the Conservatives were in power, Grey continued to sit in the House as a private member. Always inclined to be reticent, he took small part in the discussion of public questions, except when foreign affairs were under consideration, but he seems to have won recognition for his abilities from his fellow-members.

SIR EDWARD GREY

It is no injustice to Grey to state that the public at first had little confidence in him as Secretary for Foreign Affairs, yet within a few years he was recognized not merely as one of the strongest men in the Cabinet but as the commanding figure in European diplomacy. Grey took office at a critical time, and between 1905 and 1914, when the conflict did break out, there were several occasions when it seemed as if a general European war were almost unavoidable. In each of these crises Grey was conspicuous, particularly in 1912, when his influence led to the London conference of the powers to consider the Balkan question. He presided at the conference, and to a large degree he was responsible for the agreement concerning Albania. Thereafter he stood second to none among the diplomats of Europe. In 1914 Grey was called on to play a difficult rôle in the complicated negotiations preceding the War of the Nations (which see). In 1916 Grey was created an earl, but by special permission of the king was allowed to take the lower rank of viscount "for personal and family reasons." It was generally assumed that the change was made in order to prevent confusion with Earl Grey, the former Governor-General of Canada; the two Greys are not related. W.F.Z.

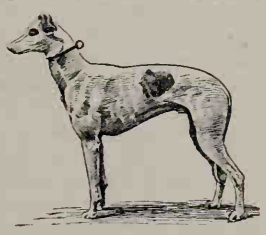
GREY, Lady Jane (1537-1554), known as "the nine days' queen," was a woman of rare accomplishments whom misfortune overtook at

every turn. She was the granddaughter of Henry VII of England, and daughter of Henry Grey, afterwards duke of Suffolk. At the age of sixteen she was married to Lord Guilford Dudley, the son of the duke of Cumberland.

LADY JANE GREY

Edward VI, who died in 1553, on his deathbed settled upon Lady Jane Grey the succession to the crown. He was influenced to do this by the persuasions of Cumberland that if the crown should descend to Mary, the work of the Reformation would be undone and the liberties of the kingdom would be endangered. The news was received by Lady Jane with unwelcome surprise, as it was by the people later, and it was long before she could be induced to accept the dignity. Edward died on July 6, and the news of his death was kept secret for four days, until after Lady Jane had been proclaimed queen. However, within less than two weeks after the proclamation Mary's claims had been recognized, and Lady Jane was imprisoned in the Tower of London. She and her husband were beheaded the following February, amid universal sympathy and compassion.

GREY'HOUND, a tall, slenderly-built dog, which hunts by sight, not scent. It is known as the fleetest of dogs, and on level country it can outdistance the horse. There are several varieties, some long-haired, others short-haired, but all are distinguished by a long, strong muzzle, very low forehead, short lips, bright eyes, long, thin legs, small muscles and contracted belly. The name does not refer to color, although many are dark grey, but is derived from the Icelandic word *grey,* meaning *dog.* The American greyhound was used, especially in the West in earlier days, for hunting jackrabbits, pronghorn antelopes and coyotes. The English greyhound is used to hunt hare. Other varieties are the Irish greyhound, to whose development clubs are devoted; the Russian wolfhound, the Scotch deerhound, the Italian greyhound and Persian *long dogs.* See Dog.



THE GREYHOUND

GRIEG, *greeg,* Edvard Hagerup (1843-1907), one of the most universally popular and beloved of modern composers, through whose influence Norwegian moods and Norwegian life have pervaded the world of music. One critic has called him the "Chopin of the North," and all authorities unite in declaring him one of the most original of the modern geniuses in the musical world.

Grieg was born at Bergen, Norway, and studied at Leipzig and Copenhagen. He made several triumphant concert tours through Norway, Italy, Germany, France and England, but he preferred to devote himself almost entirely to composition, rather than to recitals. His compositions are noted for their brilliant and effective local coloring; his music is filled with the enthusiasm and vigor of Scandinavian life, and many of his themes are drawn from Norwegian folk stories and national airs.

Although physically an invalid almost his entire life, an exuberant joyousness that ordinarily comes only with health permeates his works. His gift to posterity consists in 125 songs, which but two or three masters have equaled and which his wife inspired and interpreted. Among his other famous compositions are the *Peer Gynt Suite,* his *A Minor* for pianoforte and his *Sonata* for pianoforte and violin in F Major.

GRIMMS' FAIRY TALES. What joy and entertainment such stories as *Hänsel and Gretel, Rumpelstiltskin, The Goose-Girl, Tom Thumb* and *Snow-White* have furnished to boys and girls, who for nearly a century have been reading these fascinating tales collected by two brothers, named Grimm. During the first half of the last century these brothers went out among the country people of their fatherland, Germany, and collected all the fairy stories they heard. These were stories that had been told by German mothers for years, but had never been written. The Grimms were grave and learned men whose original wish was to produce books for students, but they made themselves famous forever when they published the fairy tales which they had collected. The stories, which were written in German, have been translated into all the principal languages of the world, and have made the name of the brothers Grimm as well known in

America as it is in their native land. The stories are short and simple tales about beautiful maidens and kings or princes who always "live happy ever afterwards," but even an older person, in whom the blessed gift of imagination has not died, can enjoy them as much as a child.

Jakob Ludwig Grimm (1785-1863) and **Wilhelm Karl Grimm** (1786-1859), the brothers Grimm, as they are generally called, were not in the least like the sort of people one would expect to find telling fairy tales. Both were sober, industrious scholars, born in Hanau, Germany, who became professors in Berlin after receiving their education at the University of Marburg. In 1837 they were among the seven professors who protested against the abolition of the constitution by the king of Hanover, and both were banished for a short time. Much of their writing was along scholarly lines; some of Jakob's work is especially important, for he published a German grammar of four volumes in 1819, which laid the foundation for historical investigation of the language. When writing their fairy tales they used the fictitious name of GAMMER GRETHEL, but their *Kinder und Hausmärchen* is generally known as *Grimms' Fairy Tales,* where the authors' fame rests on these stories alone. E.C.

GRIS-NEZ, *gre na',* CAPE, the point of France nearest to the English coast, the distance across to Dover being less than twenty-one miles. It is at an equal distance from Calais and Boulogne, in the Department of Pas de Calais. The headland is bare and grayish, hence the name, which means *gray nose.* On it stands a lighthouse with a revolving light 233 feet above the sea, which may be plainly seen from England. It is to this that Matthew Arnold, in his *Dover Beach,* refers when he says—

On the French coast the light comes, and is gone.

This point was attacked by the Germans in the War of the Nations, when, in 1914, they repeatedly attempted to capture Calais. From it, had possession been obtained, their great guns, shooting twenty-three miles, could have bombarded the English coast and controlled the English Channel.

GROM'WELL, the name commonly applied to plants of the borage family, having a funnel-shaped corolla which conceals the shorter stamens and seeds of stony hardness. Formerly medicinal properties were ascribed to these plants, which, however, were wholly imaginary. The common gromwell is found in dry, gravelly places in Europe, Asia, the United States and Canada. It has an erect stem with many branches, pointed leaves and small flowers. There are about forty species of this plant, which are common throughout all temperate zones; in America are eight or ten of these. Some have roots which produce a red dye similar to alkanet.

GRONINGEN, *gro'ning en,* the capital of the province of the same name in Holland, and one of the most important commercial centers in that small country. It is situated ninety-two miles north of Amsterdam, at the junction of the rivers Hunse and Aa, and is connected by canal with the Dollart Inlet, twenty-two miles to the northeast. The city is crossed by numerous canals and has extensive docks. There are important manufactures of textiles, sugar, furniture, cigars and tobacco, lumber, machinery and gold and silver ware. Its marketplace is one of the largest in Europe. Groningen was an important member of the Hanseatic League (which see) as early as 1282, when it was a strongly-fortified city. Maurice of Nassau captured it in 1594 and annexed it to the Netherlands. Population in 1910, 75,341.

GROSBEAK, *grose'beek,* a general name for various beautiful birds of the finch family, whose beaks are so thick they can open even the stones of cherries. The name was derived from the old French word *gros,* meaning *thick,* or *strong.* The rose-breasted grosbeak, which is seen throughout Eastern North America from Southern Canada to Panama, is one of the prettiest of the species. It has a sweet, joyous little song. The farmers of Pennsylvania call this bird *the potato-bug bird,* because it feeds on destructive potato beetles, as well as on flies, wasps and grubs. The male is a little smaller than a robin, is largely black, with white lower parts and a beautiful rose-red breast. Its blunt beak is yellow. A western species is called black-headed grosbeak.

GROSBEAK AND NEST

In the Southwestern United States is found the shy, handsome blue grosbeak. In solitary regions of Northwestern America, the brown and yellow evening grosbeak feeds on buds

and seeds of maples, evergreens and elders. Its song is a "jerky" warble. It received its name from the belief that it sang only in the evening. It does sing in the daytime, however, but only in the nesting season. The hardy pine grosbeak is common in pine and juniper woods of the Canadian provinces. This bird, with rose-red plumage, mixed with slaty gray, is also sometimes seen in Northern United States.

One species of grosbeak is called *hawfinch* in Europe. In America the cardinal is sometimes called grosbeak. See CARDINAL BIRD.

GROTE, GEORGE (1794-1871), an English historian who chose ancient Greece as his particular theme. He was eminent also as a philosopher and politician, and was a worker in behalf of university education.

His first published book was *The Statement of Questions of Parliamentary Reform,* which advocated popular representation, vote by ballot, and short Parliaments. In 1831 he published his important book, *Parliamentary Reform,* an elaboration of his *Statement.* However, the work which brought him greatest fame was his *History of Greece,* which appeared in twelve volumes between 1845 and 1856; it is a comprehensive study of Grecian history up to the death of Alexander. He later turned his attention to the study of Greek philosophy, which resulted in two books; he published the one on *Plato,* but that on *Aristotle* was destined to remain unfinished. Grote is buried in Westminster Abbey, near the grave of Macaulay.

GROTIUS, *gro'shius,* or **DE GROTT,** *de groht,* HUGO (1583-1645), a Dutch jurist, theologian, statesman and poet, and the honored founder of the science of international law. He was educated at the University of Leyden, taking his degree in his fifteenth year. In 1613 he was made chief magistrate of Rotterdam; in 1619, as a leader of the Remonstrant doctrine which is opposed to strict Calvinism, he was condemned to life imprisonment at Loewenstein, but escaped, with the assistance of his wife; and from 1635 to 1645 was Swedish ambassador to France. His chief work, *On the Law of War and Peace,* is considered the basis of international law, and has been widely used as a textbook. His other writings include some able translations in verse from the Greek authors and some brilliant Latin and Dutch poems. See INTERNATIONAL LAW.

GROUARD, *groo'ard,* a town in the central part of Alberta, in the Peace River country, at the western end of Lesser Slave Lake. It is on the Edmonton, Dunvegan & British Columbia Railway, 250 miles northwest of Edmonton and sixty-seven miles southeast of Peace River Crossing. In the vicinity of Grouard are coal and clay deposits, and there is also abundant lumber. Whitefish are plentiful in Lesser Slave Lake. The Peace River District is the last extensive area in Western Canada where homesteads may be obtained and Grouard has a Dominion land office. Grouard is the natural supply center for the eastern part of this district, and in spite of the lack of adequate transportation facilities to the present time it has grown rapidly since 1911, when its population was only 447. In 1914 the town police census showed a total of 1,492, and with the westward extension of the railway the town is destined to greater importance. The town was named in honor of Bishop Emile Grouard (born 1840), a French Roman Catholic priest who came to Canada in 1860, became a missionary under Archbishop Taché and in 1902 was consecrated Vicar Apostolic of Athabaska.

GROUND HOG, the name applied to an active member of the squirrel family, known also as the *woodchuck,* and recognized by its long, coarse fur, which is blackish or grayish above and chestnut-red below, and by its

THE GROUND HOG
As a weather prophet he is credited with powers he does not possess.

short, thick legs, bushy tail, broad, flat head and long whiskers. The ground hog is about the size of a house cat. It is a North American resident, ranging from Hudson Bay to South Carolina and west to Nebraska. Its home is burrowed in fields, on the hillsides or under rocks in the woods, and is divided into several compartments. That no water may enter its domicile, the animal always burrows on an upward slant, throwing out the dirt with its sharp-clawed forefeet and scraping back with the hind ones.

Red clover and alfalfa and early garden vegetables are relished by this active little creature. When it leaves home for a meal, it first squats on its haunches before the door, to take a survey of the premises, turning its sharp eyes and ears in all directions for sights and sounds of danger. If the way is clear, off it bounds to the field or garden. During the fall and winter, between late September and March, the ground hog retires to its burrow for a long winter's sleep (see HIBERNATION).

There is a tradition, absolutely valueless, that on the second day of February it emerges from its burrow to view the weather conditions. If the sun is shining and the ground hog can see its shadow, it is a sign that spring is still six weeks off, and the wise little animal goes back to bed to escape continued cold weather. The flesh, especially that of the young ground hog, has an agreeable flavor. The name *ground hog* is self-explanatory; woodchuck is a corruption of *wecjack,* which is derived from the Cree Indian name *otchoch.*

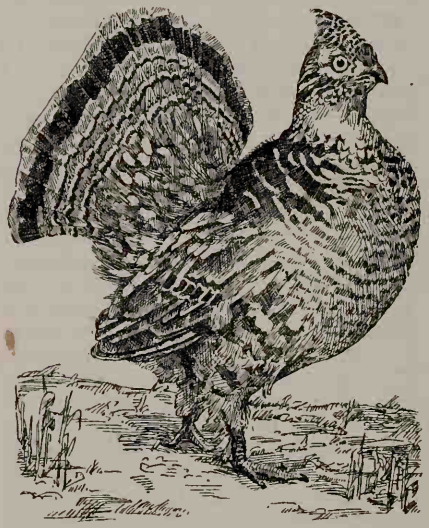
GROUSE, *grous,* a group of dull-plumaged, scratching game birds common in the northern parts of America, Europe and Asia. In addition to those shy, wily drummers of woodlands, the grouse proper, this family includes the bobwhite, or quail, capercailzie, ptarmigan and partridge, each described under its title in these volumes.

General Characteristics. Like fowls, grouse have four toes, the hind one raised above the ground. Feathers conceal the nostrils and fill the nasal groove. As these birds frequent high altitudes, most species have feathered legs to keep those parts from being frozen. They have well-developed breast muscles, which are the most edible portions of the birds. The heads of grouse are high at the rear and contain a wonderfully-developed brain, and the rare intelligence shown by the birds in eluding sportsmen makes the chase for them interesting. It is the habit of grouse to lie hidden until the huntsman's trained dogs are upon them and then to fly off rapidly with a great whirring of their stiff-feathered, concave wings. Under such circumstances a man must be cool and quick to shoot the bird.

In breeding season the males become fierce and fight each other viciously after dancing, booming, drumming and performing before the hens. The victorious male then mates with all the females of the "harem" for which he has fought. As soon as the females begin to sit, however, in their well-hidden nests on the ground, the male leaves them alone to take entire care of the young. There are usually from ten to fifteen rich buff, brown-dotted eggs, which hatch into downy, brown birds. These chicks leave the nest almost immediately after breaking from the shell. When the brood is in danger, the mother grouse gives a shrill call and the chicks quickly scamper to hiding places; she then pretends to be lame to attract attention to herself and to lead the intruder away from her babies, but when the enemy approaches too close she quickly flies away. When the young grouse no longer need care, father grouse returns and joins the flock, or *covey.*

In the summer, grouse feed chiefly on insects and berries. In autumn, grainfields are frequently visited, for seeds are added to their diet, and in winter, when snow covers the ground, catkins, leaves and buds constitute the food of grouse families.

Ruffed Grouse. One of the most important American game birds is the superb ruffed grouse, the *pheasant* of the South, the *partridge* of woods of the North. It is a handsome brownish bird, nearly a foot and a half long.



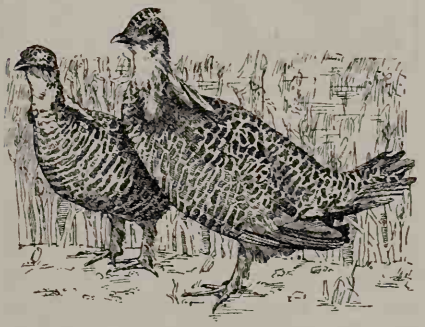
THE RUFFED GROUSE

On each side of the neck is a ruff or tuft of shiny, black feathers. The range of ruffed grouse is the Eastern United States and Southern Canada, west to Minnesota, south to Georgia, Mississippi and Arkansas. It is famous alike for its delicious, tender flesh and

its strange, thundering love song, the *thump-thump rup-rup r-r-r-r* which, once heard, is not easily forgotten. This bird, strong of wing, vigorous, wily and watchful, is well fitted to fight for existence. But the desire of sportsmen is rapidly decreasing the ranks of ruffed grouse, and as the birds do not migrate, the states in which they appear must strengthen existing game laws to prevent their extinction.

The *spruce grouse*, which was once common in Michigan, the Adirondacks of New York and Northern New England, is another family of grouse which is rapidly being destroyed by hunters. *Franklin's grouse* and the *dusky grouse* of Northwestern United States and Canada are called *fool hens*, because they are so unsuspicious that they stand curiously watching an approaching enemy and so are easily caught or shot.

Prairie Chicken, or Pinnated Grouse, a bird of the open prairie, another noble member of the grouse family once numerous throughout the Central United States, but now almost exterminated in many regions. It is



THE PRAIRIE CHICKEN

also found in parts of Canada. The call of the prairie chicken is loud and hollow, and almost as peculiar as the drumming of the ruffed grouse. On each side of the neck of the male prairie chicken is a large loose sac which can be inflated at will, to look like a great orange. At the back of the neck are tufts of long, black feathers. All these peculiarities are to attract the females at mating time. Unlike other grouse, prairie chickens migrate, and they can fly long distances.

Among species not mentioned above is the *sage grouse*, a game bird next to the turkey in size. M.S.

Consult Coues' *Birds of the Northwest*; Leffingwell's *Shooting on Upland, Marsh and Stream*.

GRUNT, an American species of game fish, so named from the sound it makes when removed from the water. It is sometimes called *drumfish*, *pigfish* and *redmouth*. This genus has about fifty-five species, and all have more or less orange and red markings inside the mouth. They are valued as important food fishes. The pigfish reaches a length of from twelve to fifteen inches, and is found on the South Atlantic and Gulf coasts, ranging as far north as Long Island Sound. It prefers sandy shores and is taken in seines or nets. In some places this species of pigfish is known as the "sailor's choice," a term denoting their preference for it.

GRUNTER. See GURNARD.

GUADALAJARA, *gwah thah lah hah' rah*, the capital of the state of Jalisco, Mexico, 380 miles northwest of the City of Mexico, was founded in 1531, and is the second city in the republic in size and importance. Its principal buildings are the cathedral, which dates from 1618 and contains a famous *Assumption* by Murillo; a mint, Episcopal palace, numerous scientific and educational institutions and a public library of 24,000 volumes. Its theater, the Degollado, is the second largest in America. Coffee is grown, and paper, Panama hats and leather are manufactured. There are also important steel and glass industries. Population in 1910, 118,800.

GUADALUPE HIDALGO, *gwah thah loo' pah e thahl' go*, TREATY OF, a compact between the United States and Mexico, entered into on February 2, 1848, at the close of the Mexican War. The negotiations were conducted at Guadalupe Hidalgo, a small town three and one-half miles north of the City of Mexico. By the terms of this treaty the United States secured the territory comprising the present states of California, Nevada and Utah, most of the present New Mexico and Arizona, and part of Colorado and Wyoming. The Rio Grande was agreed upon as the boundary between Texas and Mexico. In addition, the United States agreed to pay Mexico $15,000,000 and to assume the payment of all claims, not exceeding $3,250,000, held by American citizens against Mexico which had originated prior to the date of the treaty. See MEXICAN WAR.

GUADELOUPE, *gaw da loop'*, an island of the West Indies and one of the principal French colonies, is noted for its fine quality of cocoa, sugar and coffee. It has an area of 619 square miles with its island dependencies, and is divided into two parts by a strait called

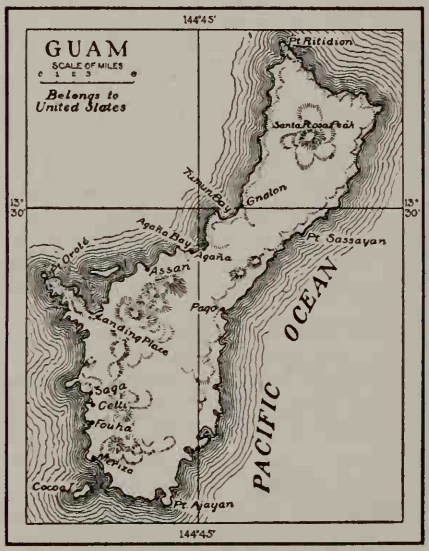
the Riviere Salee, or Salt River. The western part, called *Basse-Terre,* is mountainous and covered with forests. One of its highest points is Soufrière, a volcano 5,000 feet high, which is occasionally active. *Grande-Terre,* the eastern division, is flat and rises only about 450 feet above sea level. This portion is about thirty miles long and about twelve miles wide, and is composed mainly of coral and limestone. The climate is hot and not very healthful; the mean temperature is about 78°. Earthquakes and hurricanes are frequent, an especially disastrous earthquake having occurred in 1843.

The island is a department of France and is represented in the French government by one senator and two deputies. The small adjacent islands under the rule of the colony are Desirade, Maria Galante, Les Saintes, Saint Bartholomew and part of Saint Martin. The chief products include sugar, cocoa, coffee, bananas, tobacco and sweet potatoes, the revenues amounting to about $1,400,000 annually. The chief seaport is Pointe-a-Pitre, with a population of 17,000, the total island population being about 167,000. There are elementary schools and good roads. The island was captured and recaptured by the French and the English during their various wars, but at the treaty of peace which closed the Napoleonic era was finally ceded to the French.

GUAM, *gwahm,* or **GUAJAN,** *gwa hahn',* an island belonging to the United States, one of the group of Ladrone Islands, in a far-away spot in the Pacific Ocean, 1,500 miles east of Manila. It is about 210 square miles in extent, and has been described as the smallest and most isolated possession of the United States. Magellan first discovered the island in 1521, but it did not become a Spanish possession until 1561. By the Treaty of Paris, in 1898, closing the Spanish-American War, it was ceded by Spain to the United States. Since that time the island has made rapid progress. It is a regular port of call between America and the Philippines, and has become of special value to the United States since the opening of the Panama Canal, as it is expected to become a naval station of great importance. A freight line has also been established to export its products.

The island raises copra, spices, pineapples, cotton, coffee, sugar, tobacco and sweet potatoes. Agana, the capital, is becoming well Americanized, with elementary English schools. An agricultural experiment station has also been established by the Federal government. The temperature is mild and the climate comparatively healthful.

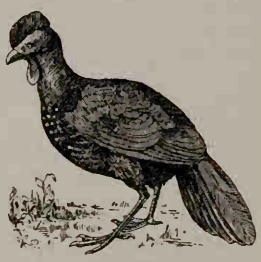
The chief executive is an officer of the navy, who is appointed by the President of the United States and who holds the title of governor. The total population of the island is about 13,000, and is composed largely of peaceable, intelligent blacks.



GUAM

Destined to become a naval stronghold of the United States in mid-Pacific waters.

GUAN, *gwahn,* a member of a family of game birds having four toes and blunt claws adapted for walking. It is related to the curassows, or turkeylike birds, and ranges from South and Central America into Mexico and Texas. It is about thirty inches long and generally brown or olive-green in color, with a long tail and only a narrow strip of feathers on its throat. There are several species of these birds, one of them, the *chacalaca,* ranging in Texas. This bird lives in large flocks and is easily domesticated. From Mexico southward



THE GUAN

it is considered a table delicacy, much as is the partridge in more northern latitudes.

GUANACO, *gwah nah'ko,* one of the four species of the wool-bearing animals of South American that belong to the family of camels, the other three being the llama, the vicuna and the alpaca. The guanaco and vicuna run wild, while the alpaca and the llama are domesticated. The guanaco is a large and heavily-built animal, with red, woolly hair, but is sure-footed and swift and looks much like a camel without a hump. The range of the guanaco extends from Patagonia and Tierra del Fuego to Peru and Ecuador, but it is chiefly found in Southern Peru. It supplies the natives of these countries with food and clothing, and the skins are used to make tents. See LLAMA; ALPACA; CAMEL.

GUANAJUATO, *gwah nah hwah'toh,* or **SANTA FE DE GUANAJUATO,** the capital of the Mexican province of the same name, noted for its silver mines, at one time the richest in Mexico. It is beautifully situated in a valley 6,200 feet above sea level, 165 miles northwest of Mexico City. The city was founded in 1554, and for many years was the center of terrific struggles between the natives of the province and the Spaniards. From a city of 100,000 inhabitants it has gradually declined, many of its silver mines, the chief source of revenue, having been abandoned as they were too deep to pay for working. Modern machinery and electricity are now putting new life into the mining industry, and silver is once again the most important local product. There are also woolen, cotton and flour mills, and manufactures of chemicals and silverware. Population in 1910, 35,682.

GUANO, *gwah'no,* a Spanish word applied to deposits of the excrement of sea birds, such as pelicans, penguins, petrels, cormorants and gannets, which live in large colonies. When thoroughly decomposed, these deposits form a valuable fertilizer, possessing large proportions of nitrate and phosphate compounds. Its use as such has been on the decline for a number of years, owing to the growing popularity of other fertilizers. The islands off the coast of Peru are the chief sources of the supply, but the deposits are becoming exhausted, and guano is being supplanted by cheaper fertilizers. The deposits found on the Chincha Islands at one time covered the surface to a depth of more than 100 feet. In 1840 the Peruvian government began exporting guano, and the supply there continued plentiful for thirty years. Guano has been found in many parts of the world, but it seldom occurs in quantities sufficient to pay for collection at a distance of more than twenty degrees north or south of the equator.

No definite rule can be laid down as to what kind of soil is most benefited by the use of guano. If careful analysis shows that the soil is weak in nitrates and phosphates, guano may be used to supply the need. It should always be thoroughly mixed with four or five times its bulk of fine soil before being applied.

GUARANTEE, *gair an tee',* an obligation created by warrant or contract to pay the debt of another in case the latter defaults in payment. The *guarantor* is the person making the promise; the person in whose interest the promise is made is the *principal,* and the *guarantee* is the person to whom the promise is made. A provision is made in the statute of frauds that no person shall be liable for the debt, default or failure of another unless a written agreement is signed by the guarantor, or his authorized agent, for this purpose. In the event of the guarantor being called on to pay the debt an indemnity or reimbursement against loss is usually provided for by bond. If there are a number of guarantors, and they are obliged to pay the debt, each must pay his agreed proportion.

GUARDIAN, *gahr'di an,* in law, the legal representative and custodian of infants—that is, persons under the age of twenty-one. Parents themselves are called guardians *by nature* or *for nurture.* The courts appoint guardians when necessary. A guardian is not permitted to reap any benefit from his ward's estate, but must account for all profits. He can invest the money of his ward in real estate only by order of the court, and he can convert real estate into personal property only by a similar order. If he spends more than the interest and profits of the estate in the maintenance and education of the ward, without permission of the court, he may be held liable for the principal thus consumed.

A ward owes obedience to his guardian, which a court will aid the guardian in enforcing. A ward cannot marry without the consent of his guardian. He could not bring an action at law against his guardian, but might file a bill in court calling him to account. At the age of fourteen, the ward is usually entitled to choose a guardian, his choice being subject to the rejection of the court, for good reason, when he is entitled to choose again.

GUATEMALA, *gwah te mah' la,* a picturesque and beautiful tropical country, the largest and most northern of the republics of Central America. It lies wholly in the torrid zone, from about 13° to 18° north of the equator, between Mexico on the north and west, and British Honduras, the Gulf of Honduras, Honduras and Salvador on the east. On the south is the Pacific Ocean. It is exactly south of a line drawn through Saint Louis and New Orleans. Covering an area of 49,290 square miles, it is slightly larger than the state of New York. Its population of 2,119,000 in 1914 was but two-ninths that of New York, and only about twice that of its southeastern neighbor, Salvador, which is only about one-seventh as large.

The name Guatemala is probably of Aztec origin; some authorities translate it as *Land of the Eagle* or *Land of Forest,* while others connect it with the volcano Agua, interpreting it, *Mountain vomiting water.*

Climate, Land and Products. Guatemala is mountainous and hilly in most places. On the northeast coast is a hot, marshy, forested tract, still largely unexplored. It is a section partly of jungles, fever infested, and the home of poisonous snakes, but there are also dense forests of valuable mahogany, with magnificent orchids and rare and brilliantly-colored birds. Cacao is cultivated to some extent in that section, and bamboo, coco palms and rubber trees grow wild.

LOCATION MAP

Showing the position of the republic in Central America, and its comparative size among its neighbors.

The central portion is a high plateau surmounted by mountain ranges attaining an elevation of 11,000 feet at the highest point. In that section, on plains from 2,000 to 6,000 feet above sea level, the climate is temperate and healthful, with sufficient rain for agriculture. Coffee is the principal product of the country and is raised chiefly in these temperate regions. Over $12,000,000 worth of coffee is exported each year. Sugar cane, tobacco, cotton and tropical fruits are also cultivated in the lower regions. Ramie, henequen and other fiber plants are grown to some extent. Going higher, wheat, potatoes, apples and corn are the principal crops. Above 10,600 feet, in the colder regions, there is no agriculture, but there is some mountain grazing.

In the mountains bordering the plateau on the south are numerous volcanoes, most of them extinct. Notable among them is the famous Agua, one of the highest in Central America, its height being estimated as between 12,300 and 13,500 feet. It received its name because it throws forth great volumes of water and large stones, instead of fire.

Rivers on the Atlantic slope, though fairly long, are of little use as highways, except Motagua, which is navigable for 100 miles. Those on the Pacific slope dash in torrents down steep slopes to a narrow plain on the coast. There are numerous lakes, those in the mountains being very beautiful. Lake Yzabel, in Northeastern Guatemala, is navigated by steamers. Lake Peten, in the north, is the largest. All these waters are well stocked with fish, but fishing is attended with danger, for there is always the chance of a fierce puma or jaguar jumping out of the forests, and alligators and serpents are numerous.

Silver, gold, copper, iron and lead mines are worked to some extent, and the mining industry is encouraged. Marble is abundant.

Transportation and Commerce. As most of the important industries in Guatemala are owned by German and American companies, so also are the more than 500 miles of railway. Outside of the railways most of the traffic of the republic is on mule-back, and although there are a few good roads and many bridges, transportation facilities are still inadequate.

On the Atlantic side of Guatemala the chief ports are Puerto Barrios and Livingston. Vessels of the United Fruit Company run from New York and New Orleans to the former, and steamers of the Hamburg-American line from Hamburg touch both ports. The chief ports on the Pacific side are San Jose, Champerico and Ocos, which are visited by the Pacific Mail line and the Mosmos line; the opening of the Panama Canal has made access to these ports easier for steamers from the east. Yearly exports average about $10,500,000, and imports are very nearly as much.

People and Government. About sixty per cent of the people are pure Indians, descendants of a highly-developed race whose origin has not as yet been determined. It is thought they are allied to, or were the same

as, the Toltecs or Aztecs of Mexico (see AZTEC). There are a number of Spanish-Americans, Germans and other foreigners, but the foreign population does not greatly exceed 12,000; nearly all the remainder are half-castes.

Although, as in all other Central American countries, the natives are shiftless and lazy, Guatemala has the best system of education in the Central American states. Education is free and compulsory. To bring people of other lands to the country immigration is encouraged by free distribution of uncultivated lands to immigrants. The prevailing religion is Roman Catholic, but all creeds are tolerated. Spanish is very generally spoken.

The government of Guatemala is in the hands of a President and his Cabinet, a National Assembly and a Council of State. A Constitution, adopted in 1879, is the basic law of the republic. For administration of government, Guatemala is divided into twenty-three departments, or small states.

History. The history of Guatemala is practically a part of that of all Central America (see CENTRAL AMERICA). It formed a part of Spanish territory, became free in 1821, and for a short time belonged to Mexico. It joined with the other states in the Confederation of Central America, but has been independent since 1833.

Guatemala, or **Guatemala la Nueva,** sometimes also called SANTIAGO DE GUATEMALA, is the capital of the republic and its commercial center. The city is situated in a rich plain

A SCHOOLHOUSE IN GUATEMALA

The walls are built of upright poles fastened together with ropes made by women from hemp or leaves. The steep roofs are thatched. The single room of such a building usually has no floor.

eighty-five miles from the Pacific coast and about 5,000 feet above the sea. As it is located in the earthquake section of the country, most of the houses are of one story, therefore the city, with a population of over 90,000 in 1917, covers a comparatively large area.

The present city is the third to bear the name, and it will be given to a fourth, for on December 26 and 27, 1917, the town was practically destroyed by a series of earthquakes, and 80,000 of its people were rendered homeless. Rebuilding began as soon as conditions permitted. Before this last visitation Guatemala was a rather handsome tropical city. The chief place of interest was the great square, in which

FORMER ROYAL PALACE

This building yet stands, at Antigua. It is an impressive reminder of the splendor of the ancient capital.

were located the old viceregal palace, the government offices, the cathedral, the archbishop's palace, the barracks, several schools and most of the stores. Public libraries were maintained, and there were hospitals, a national palace and theaters. M.S.

Consult Winter's *Guatemala and her People of To-day;* Fife's *Guatemala and the States of Central America.*

GUAVA, *gwah'vah,* a small tree or shrub at one time known only in tropical Asia, but now cultivated and a source of income in the Southern United States. It is esteemed for its edible fruit, especially valuable for jellies and preserves. The species most commonly grown in Florida and the Indies is the *lemon guava.* It grows about twenty feet high, and the numerous branches bear blunt leaves two or three inches long. Following white fragrant flowers the fruits appear—roundish or oblong, smooth, yellow, and about the size of a hen's egg. The firm, flesh-colored, sweetish-sour pulp is filled with horny seeds. The thin, brittle rind, stewed with milk, makes a marmalade.

From over 15,000 guava trees in bearing in Florida and California about 355,000 pounds of fruit are produced yearly, valued at over $11,500. Florida leads in the production of this fruit. A *red guava,* bearing a beautiful, red-fleshed fruit, grows in the Indies, but is less

cultivated than the lemon guava, being more acid. The *strawberry guava,* bearing a small, claret-colored fruit, is excellent for preserves.

GUAVA

Fruit and cross section of same, and leaves of the tree.

GUAYAQUIL, *gwah ya keel',* the chief seaport of the republic of Ecuador, on the Pacific coast of South America. Through that city over $15,000,000 worth of exports pass each year, consisting chiefly of cacao, coffee, Panama hats, ivory nuts, gold, silver, quinine and hides. The imports through the port exceed $7,000,000 yearly.

Guayaquil is situated on the west bank of the River Guayas, forty miles above its entrance into the Gulf of Guayaquil. It lies on a low plain and is divided into two parts. The old part is a quaint place of crooked, unpaved streets, and at the water's edge merchants display their wares in canoes. The new part contains the residences of the well-to-do people and the most important places of business. The chief buildings are the cathedral, university, bishop's palace, town hall and hospitals. Through a lack of good drinking water and the presence of marshes behind the town, Guayaquil has been a place of fever, but sanitary improvements were started in 1913.

A railway from Duran, opposite Guayaquil, brings this seaport into touch with Quito, the capital of Ecuador, 165 miles northeast, high in the mountains. Telephones and electric cars facilitate communication among the population of about 80,000, as estimated in 1910. Telegraph wires and cables connect Guayaquil with other parts of the country and the world, and steamships from all countries enter its port. Boats running for short distances on the Guayas River and its branches connect Guayaquil with the surrounding country. Its harbor is well protected by a breakwater. Its shipyards rank among the best on the west coast of South America. In addition to shipping activities, Guayaquil has sawmills, sugar refineries, cotton and woolen mills, a foundry and a brewery, and soap, cigars, chocolate, ice, soda-water and liquors are manufactured. M.S.

GUELPH, *gwelf,* the county town of Wellington County, Ontario, an important manufacturing, distributing and educational center in the central part of the Ontario peninsula. It is on the Speed River, which here falls thirty feet and provides abundant power. Railway service is offered by the Grand Trunk and Canadian Pacific railways, which connect Guelph with Toronto, forty-eight miles east, Kitchener (formerly Berlin), fourteen miles west, and other points. Hamilton is twenty-eight miles overland to the southeast. Guelph was founded in 1827 by John Galt, the novelist, and was incorporated in 1877. Population in 1911, 15,175; in 1916, estimated, 18,000.

Guelph is the seat of the Ontario Agricultural College, the oldest and most famous school of its kind in Canada; its students, who number about 1,200, come from all parts of the world. In connection with the college is Macdonald Institute, a school of domestic science for girls. In addition to the power derived from the falls of the Speed River, Guelph's manufactures receive electrical power from Niagara Falls. The city's manufactured products, which have an annual value of $8,000,000 to $10,000,000, include pianos and organs, sewing machines, carpets, clothing, steel and wire goods, boots and shoes, and meat products. Stock-raising is one of the principal pursuits of the neighborhood, and Guelph's annual stock show is notable. The city owns the Guelph Junction Railway (fifteen miles long) as well as its street railway, electric light, water and sewer systems.

GUELPHS AND GHIBELLINES, *gwelf, gib' el inz,* the names of two great Italian political factions, in the thirteenth and fourteenth cen-

turies. These terms are corruptions of the German *Welf* and *Waiblingen*, party designations in Germany, said to have been used first in 1140 as battle cries in the battle of Weinsberg between the Welfs of Bavaria and the imperial line of Hohenstaufens, to whom belonged the estate of Waiblingen. In Italy, the names acquired a different meaning: the Guelphs referring to the Italian patriotic party, which demanded an Italy freed from German interference; the Ghibellines, the imperial party, which supported the domination of the German emperors in Italy. These factions came into prominence in the Lombard League of 1167.

To give a full account of the quarrels of Guelphs and Ghibellines would embrace the history of medieval Italy. After the fall of the Hohenstaufens (which see) the Ghibellines became the representatives of the aristocracy, and the Guelphs were the partisans of democracy and liberty. At the beginning of the fifteenth century the rivalry began to die out gradually, and came in time to denote mere family feuds.

GUERNSEY, *gurn'zi*, the second in size and most western of the Channel Islands, belonging to Great Britain and lying fifty-one miles south of the mainland at Portland. It is especially noted for its fine breed of cattle called Guernsey, the name of which was derived from the island (see CATTLE). The area of the island is about twenty-five square miles and the soil is unusually fertile. Wheat, barley, oranges, figs, melons, grapes and apples are extensively grown. Lines of steamers ply between Guernsey and Southampton, Plymouth, Weymouth and Cherbourg, and exports of agricultural products, fresh flowers and fisheries are heavy. The capital is Saint Peter Port, which is, except Saint Sampson, the only town on the island. Although the island is English, French is the prevailing language, for it was deeply-rooted when the Channel Islands were under the rule of France prior to 1204. The population of Guernsey is about 43,000, which is about one-half that of the Channel Island group. See CHANNEL ISLANDS.

GUIDO OF AREZZO, *ah ret'so* (about 990-about 1050), is called by many the father of modern music. He invented, or for the first time systematically used, the lines of the staff and the intervals between them, and thus fixed the principle of modern musical notation. He also introduced the names of the first six notes of the scale—*ut, re, mi, fa, sol, la;* these are the first syllables of six lines of a hymn addressed to Saint John the Baptist.

Guido was a Benedictine monk, and little is known of his life. The fame of his musical invention drew the attention of Popes Benedict VIII and John XIX, who invited him to Rome and did much to popularize the new system. He left writings explaining his musical doctrines.

GUIDO RENI, *gwe'doh ra'ne* (1575-1642), master in the Bolognese (Italian) school of painting, and generally known as GUIDO, was born at Calvenzano, near Bologna. His father, a musician of repute, desired to bring up his son to perform on the harpsichord, but at a very childish age Guido displayed his determination to devote himself to painting. At the age of nine he began his studies, and so rapid was his progress that when he became thirteen he already had won an enviable reputation.

Guido is particularly distinguished for the gentleness and sweetness of his characters and for his harmonious style of execution, although strength and originality are somewhat lacking, as is evidenced in his masterpiece, *Phoebus and the Hours Preceded by Aurora.* After the completion of this work so great was the demand for his art that he was obliged to refuse many commissions. Among his other admired paintings are his *Niobe* group, the *Venus de' Medici, Israelites Gathering Manna, Lot and His Daughters,* and *Fortune,* an allegorical picture several times repeated and found at Berlin, in the Capitol at Rome, and in the Louvre in Paris. He also left many etchings executed with much grace and freedom.

GUILD, *gild.* Perhaps the most interesting phase of the study of history is to observe how the tendencies which man displays to-day were shown in earlier times. There is no more striking example of an institution of the past resembling those of the present than the guild of the Middle Ages. In the present age people form societies for every conceivable purpose, for business, for pleasure, for religion, for politics, for mutual protection or advancement, for advocating or protesting against legislation. Considering the simpler state of political and social organization which prevailed at the time, the guilds were no less varied. We know them best as societies of merchants and workmen, but there were also religious guilds, military guilds and social guilds.

Merchants' Guilds. These organizations were more important in England than elsewhere; they

flourished from the twelfth to the fourteenth century. The members of any guild were usually all residents of the same town, and included both merchants who bought and sold and artisans who made their own products. The guild was often granted a monopoly of the retail trade in its town, with the privilege of taxing outsiders who brought in goods. Anyone could join it who was willing to share in the taxes of the town. So we see in this type of guild the seed of the policies of several modern organizations of widely-different purpose, such as societies to promote protective tariffs, labor unions to resist the immigration of foreign workmen, and civic leagues of business men and taxpayers.

Craft Guilds. In the days of the guilds the manufacturers were skilled workmen as well as owners of the goods which they produced. In each town all those who shared in a certain craft or trade, such as weaving, or gold-working, banded together to advance the standard of their work. The members were divided into three classes, according to their skill. First were the *masters,* who alone were entitled to buy materials and sell manufactured goods. They bought and sold at prices fixed by the organization, and their establishments were under the supervision of the guild, so that no inferior product might be turned out. The second grade was composed of *journeymen,* who received wages from the masters and lived with them. When their education was completed, each was required to construct a *masterpiece* before being declared a master, just as a candidate for the degree of Master of Arts in a modern university must write a *thesis.* The beginners at the craft were *apprentices;* for their work they received board and lodging.

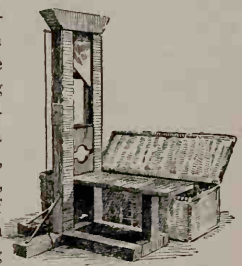
The craft guilds were most important in the fourteenth and fifteenth centuries, but a few of them survived nearly to the nineteenth century. At the time of their greatest prominence it became more difficult for journeymen to advance to the grade of master, and the journeymen formed guilds of their own which were the forerunners of the modern labor organizations. The original craft guilds, on the other hand, bear resemblance to present-day associations of competing business men. A.MC C.

Consult Seligman's *Medieval Guilds;* Staley's *Guilds of Florence.*

GUILFORD, *gil'ford,* or **GUILFORD COURTHOUSE,** Battle of, one of the last important battles of the Revolutionary War, fought on March 15, 1781. An American force had been recruited and placed under Nathanael Greene, while Cornwallis had charge of the British command. Greene joined Morgan, who had defeated Tarleton, the leader of the British cavalry, and together they retreated into North Carolina. Cornwallis followed, but failed to overtake them at once, owing to Greene's excellent generalship. A battle was finally fought at Guilford Courthouse, near the site of the present city of Greensboro, N. C., in which the Americans were defeated, but Cornwallis lost about 600 men. He then decided to go to Virginia, while Greene marched back into South Carolina and drove the southern divisions of the British forces back to Charleston. Cornwallis soon saw that no gain could be made by the British, and wrote to Washington asking what would be his terms of surrender.

GUILLEMOT, *gil'e mot,* the name applied generally to several species of birds belonging to the auk family, and especially to the common, or *foolish,* guillemot, so called because it permits itself to be captured rather than abandon the cliffs on which it breeds. This bird abounds in the Arctic regions of both hemispheres, and in the colder parts of the temperate zones, and during the winter migrates as far south as the Mediterranean Sea. It lays but one egg, which is pear-shaped, with an exceedingly thick shell, and is more than three inches long. The thick-billed guillemot inhabits the same localities as the common variety. The Pacific coast species is called the *erra.*

GUILLOTINE, *gil'o teen,* an instrument used for the purpose of beheading persons, introduced into France during the Revolution in 1792, on the suggestion of Dr. Joseph Guillotin, after whom it was named. The instrument consists of two upright posts, with a crossbeam at the top, the posts being so grooved as to allow the falling of a heavy steel knife, with a slanting edge, upon the neck of the victim, as soon as the cord holding it in place is released by the executioner. The guillotine is still the means employed in France for the execution of criminals.



THE GUILLOTINE

For a description of its use during the French Revolution, when hundreds of persons were

cruelly put to death, see that title. In Dickens' *Tale of Two Cities* the chapter "Knitting" gives a realistic word picture of the instrument.

GUILMANT, *gel mahN',* Felix Alexandre (1837-1911), a French organist and composer, whose influence upon organ music extended to many lands. He was a tireless worker. Indeed, so fast did he work, and so well also, that during one of his American tours organ pieces were written en route from New York to Philadelphia and completed before his arrival. His *Fugue in D Major* was written in a single evening and his *Second Meditation,* one morning before breakfast.

At the age of seven he began to compose music extemporaneously, and worked ceaselessly for twenty years before he developed his art to the high standard for which he became distinguished later. He was organist in many famous churches in France, and in 1896 accepted a professorship at the Paris Conservatory. Later he made several successful concert tours in Europe and America. Great as were his performances of standard works, he will be remembered for his own marvelous compositions. In his extemporaneous playing he had no equal. He composed eight organ sonatas, three masses, and organ pieces numbering into the hundreds. His *Liturgical Organist,* of twelve volumes, contains a wealth of material for the church service. He also edited an *Historical Organ Book,* containing examples of all the schools of organ playing.

GUINEA, *gin'i,* a name applied to portions of the west coast of Africa, bordering on the Gulf of Guinea and the Atlantic Ocean. Although the boundaries have never been clearly defined it is generally understood that Guinea extended from the River Gambia, in the north, to the southern boundary of Portuguese West Africa, and included Portuguese Guinea, French Guinea, Sierra Leone, Liberia, the Ivory Coast, Kamerun, Gabun, the French Kongo Coast and what is now the coast line of Belgium Kongo. The term Guinea is now practically confined to Portuguese Guinea.

The origin of the name is unknown, but it is probably derived from Ghinea, or Ginnie, a town and kingdom in the interior, on the Niger River, a commercial center in the eighth century. The name did not come into general use until the fifteenth century. Early traders divided Guinea into two countries, called Upper and Lower Guinea, the dividing line between north and south being somewhere in the Bight of Benin. See Portuguese Guinea.

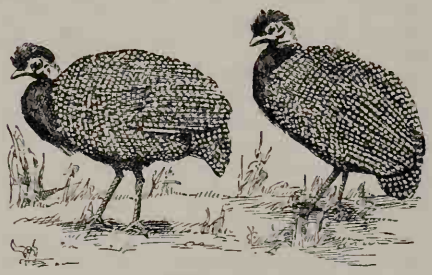
GUINEA, an old English coin, so named because it was first coined from gold found in Guinea in 1663, during the reign of Charles II. Its unit value is twenty-one shillings, or in American and Canadian money, $5.04. It was the principal English coin until 1817, when the sovereign was introduced. It is still customary, however, to estimate professional fees, such as the charges of doctors and dentists, and most charitable subscriptions, in guineas.

In literature there is frequent reference to this coin. Burns says:

> The rank is but the guinea's stamp,
> The man's the gowd for a' that.

GUINEA, Gulf of, a gulf on the west coast of Africa, an arm of the Atlantic Ocean. The name is applied particularly to that part of the coastal waters to the north of the Congo River and south of Cape Palmas. It includes the bay, or bight, which comes from the long sweep of the coast line, known as the Bight of Benin. The name *Guinea* is from that of the territory which once extended over the whole district. The Bight of Biafra, or Mafra, which is also included, contains the islands of Saint Thomas, Prince's and Fernando Po. The coast is low, and mangrove trees are the only sailing marks to guide navigators in this region. The inhabitants are true negroes.

GUINEA FOWL, a group of birds which originated in Africa and which are closely related to the pheasants. The domestic guinea fowl, which are quarrelsome and hard to raise, are unpopular because of their continued harsh



GUINEA FOWLS

cries; but these disadvantages are more than offset by the high price commanded by their flesh which, within the last few years, has become an expensive delicacy. Their eggs, which are small, spotted, and have a strong, thick shell, are also highly esteemed. These fowls have dark, slate-colored feathers, with regularly-arranged white spots.

GUINEA PIG, a little animal sometimes called the *cavy,* about six inches long. It makes an interesting pet for children and contributes largely to medical science. In their manner of life and in their food guinea pigs

GUINEA PIGS
At left, tortoise and white; at right, solid color, nearly red.

are much like the rabbits. There are several colors of these animals, known as the tortoise shells, the red, brown and white. They have small ears and no tails, and the sound they make is like a shrill whistle. Because they are naturally clean in habit and are strong, they are much used in bacteriological laboratories for experimental purposes. They will rest quietly in the hand while serum is being injected, and will resume feeding as soon as returned to the cage, apparently with only trivial discomfort. They are also used in vivisection, or the dissection of live animals, as the veins, arteries and most parts of the viscera are without the sense of touch and therefore have little sense of pain. Antiseptic precautions are used, however, and if the animal shows any signs of distress it is painlessly killed.

GUISE, *gweez,* a noble French family, the most famous branch of the House of Lorraine, several members of which had a conspicuous part in French history. The family acquired great political influence on the succession of the French king, Francis II, for his wife, Mary Queen of Scots, was a granddaughter of Claude of Lorraine (1496-1550), the first Duke of Guise. François of Lorraine (1519-1563), second Duke of Guise, was the leader of the Catholic party during the religious wars that devastated France in the reign of Charles IX. After winning several victories, he was assassinated while preparing for the siege of Orleans. His son, Henry I of Lorraine (1550-1588), third Duke of Guise, led the armies of the Catholics against the Huguenots (Protestants) in the reign of Henry III. The latter, jealous of the Duke's popularity and influence, caused him to be assassinated in 1588. After the death of Henry I of Lorraine, the Catholic forces were commanded by his brother Charles, Duke of Mayenne. Charles was defeated at Arques and Ivry by Henry of Navarre (Henry IV of France), but continued the struggle until 1596, when he made peace with the king. In 1675 the direct line of the dukes of Guise of the House of Lorraine became extinct, and the family estates passed to their nearest kin, the House of Conde.

GUITAR, *git ahr',* a stringed musical instrument with a hollow body and a neck, somewhat resembling the violin. The woods commonly used for the sides are maple, ash or cherry; hardwoods, such as ebony, beech, or pear, are employed for the neck and finger board; the bridge is of ebony. Many of the older specimens were adorned with inlays of rosewood and ornamented with tortoise shell and mother-of-pearl. The modern, or Spanish, guitar, has six strings, the three highest made of gut and the other three of silk spun over with silver. The Spanish guitar is always played with the fingers. The thumb sounds the deepest strings;

THE GUITAR

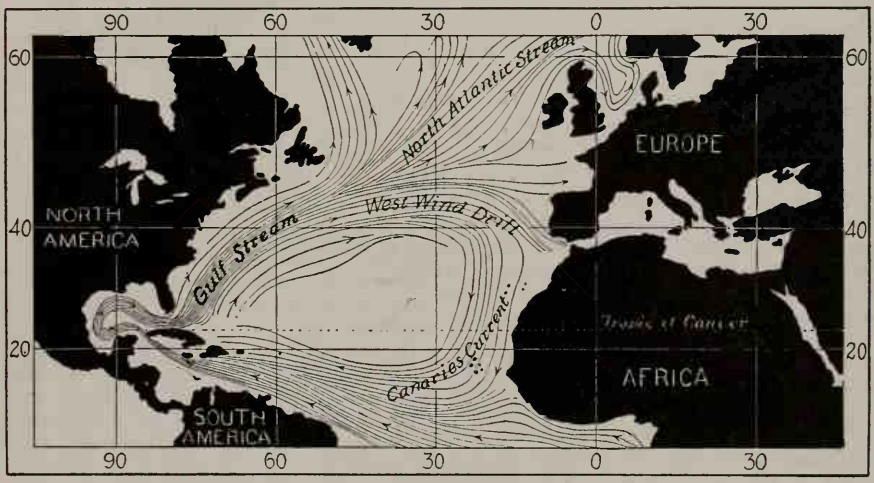
the first, second and third fingers sound the three highest tones, and the little finger rests on the sounding board.

The guitar was introduced into Spain by the Moors about the year 1288. By the beginning of the nineteenth century the Spanish guitar became a fashionable instrument on the Continent. Ferdinand Sor, a Spaniard, by means of his compositions brought the guitar into great popularity in England and succeeded in banishing the less perfect English guitar. Sor's most distinguished rival was Mauro Giuliani, an Italian. Other well-known composers were Legnani, Kreutzer, and Leonard Schulz; while Berlioz and Paganini were guitarists of note.

GUIZOT, *ge zo',* François Pierre Guillaume (1787-1874), a French historian and statesman, whose writings and lectures did much for the development of historical study in France, was born at Nimes. In 1805 he went to Paris to study law, but took up literature instead. In 1812 he became assistant professor of literature at the Sorbonne, and later in the same institution occupied the chair of modern history. His publicly-expressed political opinions led to his enforced resignation from the university. He

was elected to the Chamber of Deputies in 1830, and following the Revolution of the same year became Minister of the Interior, resigning a few months later.

In 1840 he spent some months in London as French ambassador to England, but was recalled by the king to form a new ministry. He was Prime Minister for the eight years preceding the abdication of Louis Philippe. His arbitrary refusal during this period to make concessions demanded by existing political conditions brought about his political downfall, and after the fall of Louis Philippe he fled to England. Upon his retirement from public life he devoted himself to literary work and produced a *History of the English Revolution, General History of Civilization in Europe, The History of Civilization in France* and *The History of France from the Earliest Times to the Year 1789.*



COURSE OF THE MAIN STREAM AND BRANCHES

GULF STREAM, the most important and the largest of the oceanic currents. It derives its name from the Gulf of Mexico, out of which it flows. For its origin, see the article Ocean Currents, in these volumes. The Gulf Stream issues from the Gulf of Mexico through the Florida Strait, and flows northward between the coast of Florida and the Bahama Islands. It follows a course parallel to the coast of the United States, from which it is separated by a narrow strip of cold water, known to sailors as the "cold wall." It flows past Cape Hatteras, and then moves northeastward until it reaches the southern edge of the Newfoundland Banks. Here it loses its identity as a distinct current and becomes merged into the general drift of the warm water which flows from the Atlantic in a northeasterly direction towards the coast of Europe, and is known as the Gulf Stream drift.

Description. When the Gulf Stream issues from the Gulf of Mexico it forms a well-defined current about fifty miles wide and about 2,000 feet deep, distinguished by its deep blue or indigo color and by its high temperature, which is several degrees above that of the surrounding water. The swiftness of the current diminishes as it progresses. Within the Florida channel it attains an average velocity of sixty-five miles per day; this decreases to fifty-six miles off Charleston, becomes thirty-six to forty-six miles off Nantucket and twenty-eight miles to the south of Newfoundland Banks. About 300 miles east of Newfoundland its movement is hardly perceptible.

Division. When the Gulf Stream drift approaches the European side of the Atlantic Ocean it divides into two parts, one stream going southward towards the western coast of Africa, and the other going northward along the western coast of the British Isles. This northern current then breaks into three branches. One branch runs through the strait between the Faroe and the Shetland islands, goes northward along the coast of Norway and enters the Arctic Ocean, where it spreads over a large area. A second branch flows to the west side of Iceland, while a third branch goes up the Greenland side of Davis Strait into Baffin Bay.

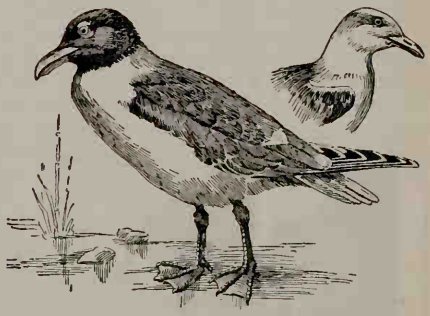
Its Influence upon Climate and Navigation. The mildness of the climate in Northwestern Europe as compared with the cold experienced in America in the same latitude has been for a long time attributed entirely to the presence there of the Gulf Stream. Some men of science, however, consider that this influence upon the climate has been exaggerated; that the mildness of winters in these regions is due more to the prevailing southwestern winds which bring moisture from the ocean. But it cannot be doubted that the exceptional mildness of these winds is caused by the great mass of warm water which is banked against the northwestern coast of Europe by the Gulf Stream drift.

Whether its influence upon the climate of Europe be great or small, the Gulf Stream fulfills another very important function. It keeps the harbors of Northwestern Europe free from ice all the winter and permits uninterrupted navigation all the year round. Its influence in this respect even in the Arctic Ocean has received quite recently a striking illustration. In the north of Russia, on the coast of the Arctic Ocean, not far removed from the most northern point on the European continent, there is a port which, being under the influence of the Gulf Stream, is free from ice all the year round. This is the port of Ekaterina (which see), situated 68° N., which has been connected with Petrograd by a railway 700 miles long, built in 1915 during the progress of the great War of the Nations. This, the most northern port of Russia, is the only one free from ice and therefore open to navigation all the year round. Archangel, Russia's other northern port, considerably farther south and east, is icebound half of each year. O.B.

Consult Riker's *The Power and Control of the Gulf Stream.*

GULLS, *gulz,* birds that are known as long-winged swimmers, living in almost all parts of the world. Though the ocean is their proper home, yet they may be seen on interior waters, near the great lakes and smaller bodies of water. Gulls pick their food from the surface of the water and do not plunge, like the terns. Gulls in large flocks on large bodies of water will follow passenger steamers for hours at a time and will eagerly swoop down to the water for food thrown overboard to them.

The plumage is pearl-blue, brown or black, varying with the season and the age. The small gulls that live near lakes are content with a diet of worms, but the large ones are as voracious, size considered, as are the eagles, and eat not only fish but useful birds. They are also scavengers, feeding on animal food, whether putrid or fresh. The large, black-backed gull is a strong, savage bird and belongs particularly to Europe. The black-headed and the herring gulls make their nests in colonies

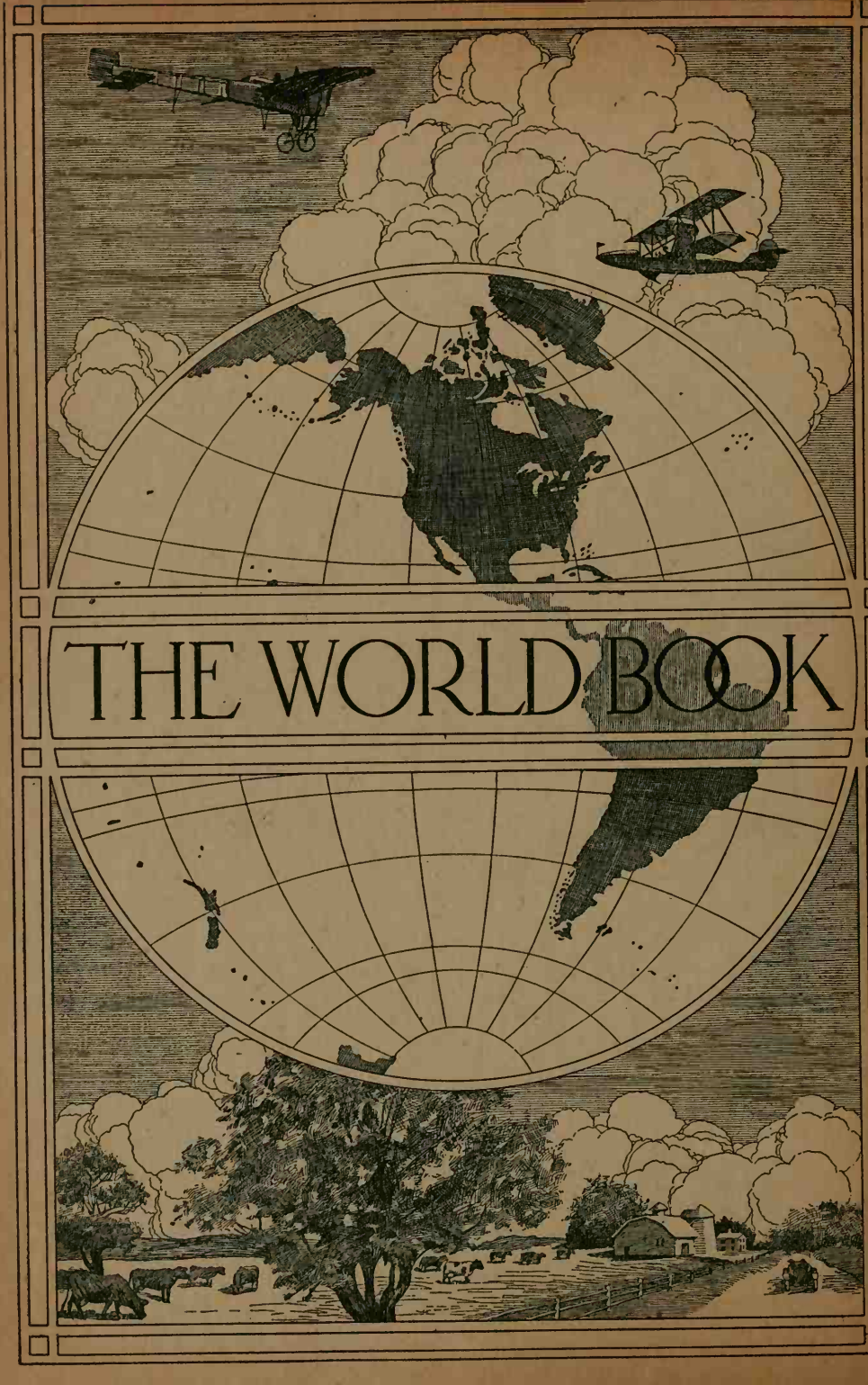


GULLS
The great black-headed gull, and head of the great black-backed gull.

in wet and swampy places, and build them high enough to be free from the water. The kittiwake gulls build their seaweed nests in wild and rocky places and are so named because their call sounds like "kittiwake." The tern, or seaswallow, belongs to the family of gulls, the black tern being one of the most common birds on inland waters. See KITTIWAKE; TERN.

GUM, the name applied to a variety of widely-differing substances of a more or less adhesive nature, which are produced from the sap which flows from certain trees, such as the plum, peach and cherry. True gum is soluble in water but not in alcohol. It is without odor and has a faintly spicy taste. Many aromatic substances which are used in the manufacture of perfumes and incense are classed as gums; gum arabic, of which there are eight or nine varieties, obtained from the Senegal acacia in Western Africa, is the best known of these. Cherry-tree gum is used in the manufacture of hats, to stiffen felts. Benzoin and some allied substances are also called gums, but they are more correctly classed as balsams. Gums are used as mixing agents in pharmacy, and as a medium for obtaining cultures in bacteriology. See GUM ARABIC; BALSAM.

End of Volume Four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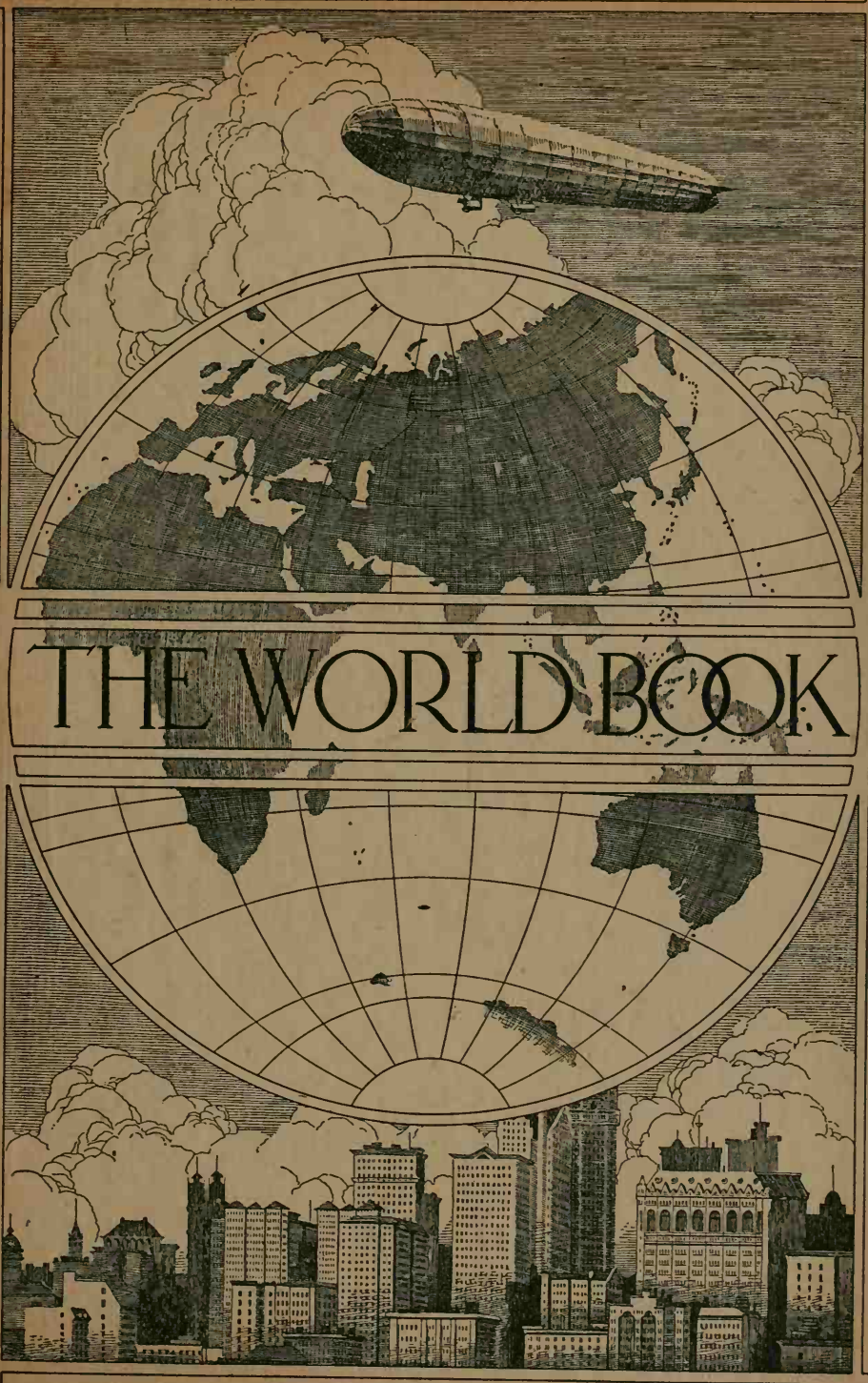

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